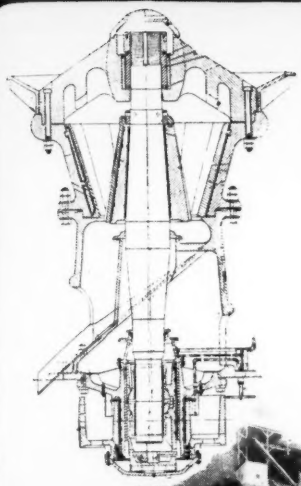
Pit and Quarry
SAND ▪ GRAVEL ▪ STONE
HANDLING ▪ CRUSHING ▪ SCREENING ▪ WASHING

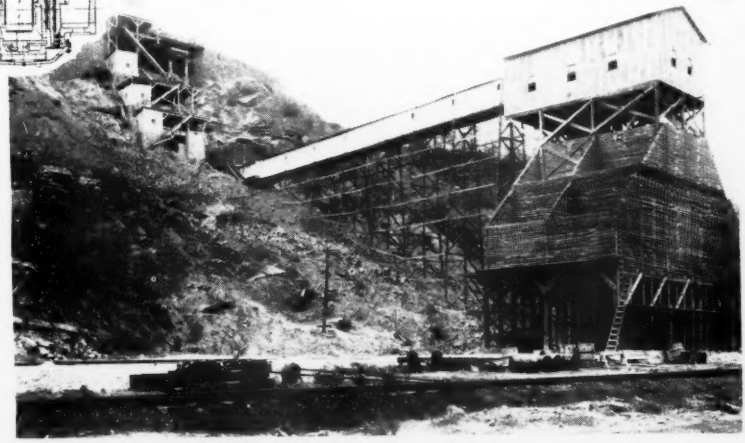


KENNEDY EQUIPMENT IS IMPORTANT IN ZENITH EFFICIENCY

The Zenith Limestone Company plant at Tulsa, Oklahoma, is a modern 2,000 ton plant. It is equipped throughout with Kennedy Gearless Crushers and Kennedy Screens.

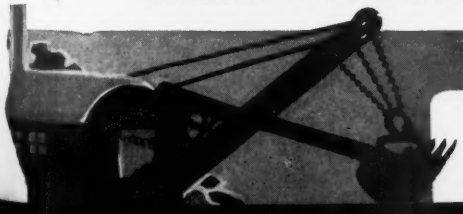
There is a reason why Kennedy Equipment is specified for so many plants. Kennedy Catalogue outlines these reasons—reasons proven in practice. Write for your copy.

KENNEDY VAN SAUN MFG. & ENGR. CORP
50 Church St. **New York City**



Standard Ball Bearing Gearless Crusher. Sizes No. 1 to No. 60 — Wt from 9,000 to 100,000 lbs.

Also fine crushers. One customer reports getting 60 tons per hour ¾" and finer with one machine.



April 15, 1925

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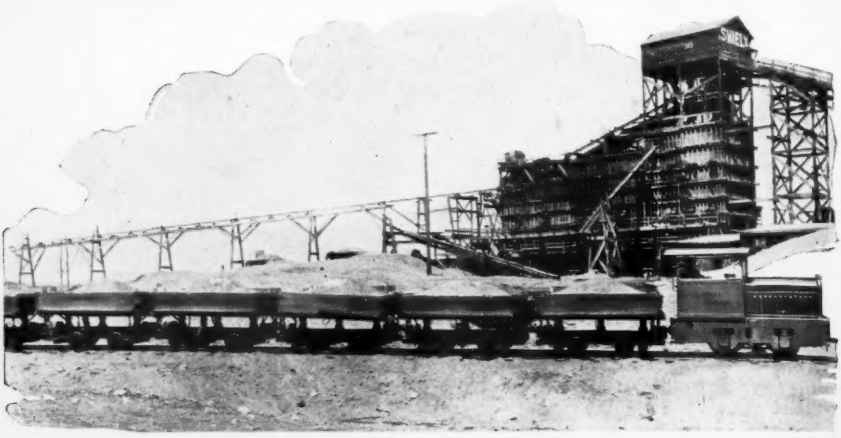
Circulation 7,690



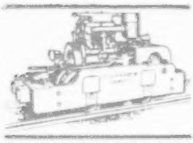
Where dependability counts!

A Whitcomb Locomotive is the one haulage tool that can be relied upon.

Where one process depends upon another and trouble-free equipment is essential, there you will find a Whitcomb Locomotive.

Since 1906, when we built the first successful gasoline locomotive, we have specialized in the building of locomotives which combined moderate first cost, low maintenance cost, with dependability. They insure trouble-free operation.

Write our nearest branch office for detailed information on the type best suited for your job.



The FIRST SUCCESSFUL GASOLINE LOCOMOTIVE WAS BUILT IN 1906 IT WAS A "WHITCOMB"

Offices in Principal Cities

THE GEO. D. WHITCOMB COMPANY
Rochelle, Illinois

Representatives:
The General Supply Company of Canada, Ltd.
Machinery Corporation, Apartado 76 B, Mexico City, D. F., Mexico.

GASOLINE-STORAGE BATTERY-ELECTRIC

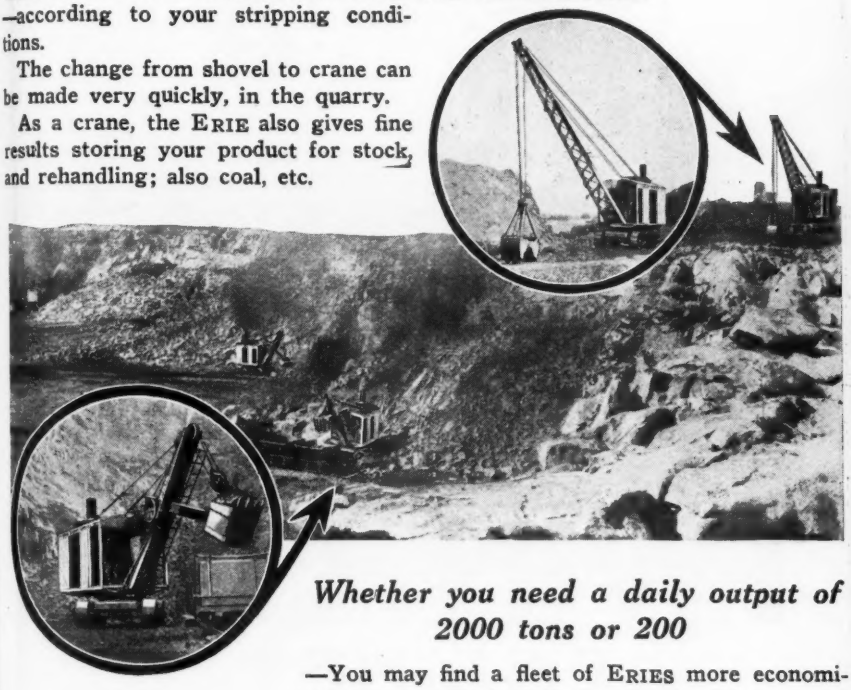
WHITCOMB LOCOMOTIVES

Two quarry jobs *for* one machine

The same ERIE Shovel that loads out your blasted rock will also do your stripping. For this purpose it can be used either as a shovel or locomotive crane with clamshell bucket —according to your stripping conditions.

The change from shovel to crane can be made very quickly, in the quarry.

As a crane, the ERIE also gives fine results storing your product for stock, and rehandling; also coal, etc.



Whether you need a daily output of 2000 tons or 200

—You may find a fleet of ERIES more economical to use than a single large shovel. Other quarry operators have learned this to their profit.

When demand is strong they keep several shovels working, each loading 400 to 500 tons per day. When orders slacken, one shovel can often load the required output. The entire loading plant is never shut down for repairs, as with a single shovel.

Quarry operators have found that ERIES turn out more output in a season's work than even larger shovels, because the ERIE keeps working steadily.

Actual records of upkeep prove that the ERIE requires only ⅓ as many repairs, and MAKES A CORRESPONDING SAVING IN WORKING TIME.

Records gladly sent. Write for Bulletin Q-70.

"We operate a large limestone quarry and all our stone is handled by four ERIE Shovels. Our stripping and coal unloading is done by a fifth ERIE working as a locomotive crane.

"Our ERIE Shovels easily load an average of 400 tons each in a 10-hour day, and under favorable conditions can produce much more.

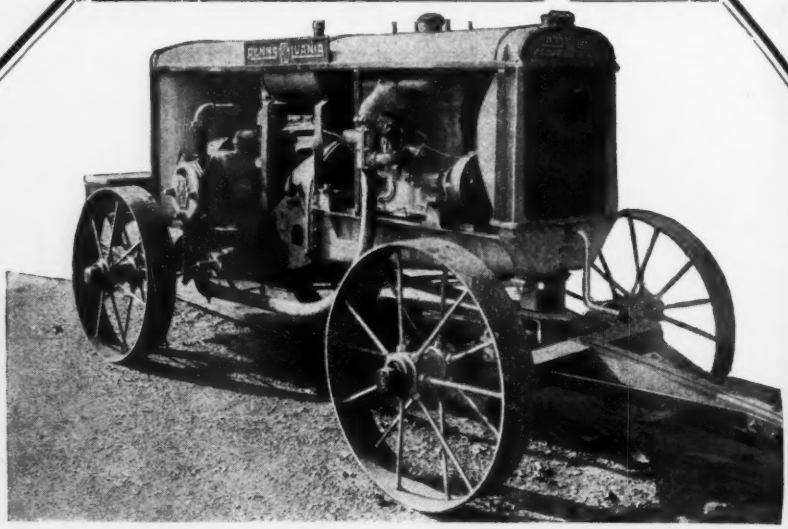
"We have used other makes of shovels in our operations but have found the ERIES far superior. They have always given us the best satisfaction—steady service, low cost of repairs and very few interruptions on account of breakdowns."—*Russell K. Forsyth, Vice Pres., Thomasville Stone & Lime Co., Thomasville, Pa.*

Erie Steam Shovel Co., Erie, Pa., U. S. A.

Incorporated 1883. *Formerly Ball Engine Company Builders of* ERIE *Shovels, Cranes, Draglines, Etc.*

ERIE Revolving Shovels

Branch Offices: Boston, New York, Philadelphia, Pittsburgh, Atlanta, Chicago. Representatives throughout the U. S. A.



Specify Twin City Engines on Your Equipment

TWIN CITY ENGINES

"Built to do the work"

The Pennsylvania Pump and Compressor Co. uses Twin City engines on their equipment because of the steady, economical power these engines provide.

A few other users are Austin Machinery Corp., Baldwin Locomotive Works, Buckeye Traction Ditcher Co., Bucyrus Co., Harnischfeger Corp., Northwest Engineering Co., The Parsons Co., Russell Grader Mfg. Co., Star Drilling Machine Co., Washington Iron Works, Willamette Iron & Steel Works, etc., etc.

Twin City Engines are manufactured in sizes 35 to 140 horsepower. Literature and specifications gladly sent upon request.

Twin City Co.

MINNEAPOLIS, MINNESOTA

Heavy Duty Engine Manufacturers Since 1903

KOEHRING

Crane Excavator

66% Greater Clutch Frictional Area!

THAT'S why the Koehring has *Finger-tip control* at the levers!

Levers work easy because the 66% greater contact surfaces of the double outside band, equalizing friction *clutch* makes the levers work easy!

So, you have Finger-tip control without mechanical complications to help shift levers which ought not to be hard shifting in the first place. The Koehring operator does not lose the *"feel"* of the bucket —an important factor in accuracy of operation!

Crane Capacities

No. 1—10 tons at 12 ft. radius. ¾-cu. yd. clamshell bucket, sand or gravel, at 30 ft. radius. Boom lengths to suit conditions. 4-cyl., 5x6 in. gas. engine, 1000 R.P.M.

No. 2—15 tons at 12 ft. radius. Handles following loads sand or gravel, (clamshell buckets): ¾-cu. yd. at 43 ft. radius; 1 cu. yd. at 37 ft. radius; 1¼-cu. yd. at 32 ft. radius. Boom lengths to suit conditions. 4-cylinder 5¾x7 in. gasoline engine, 925 R. P. M.

KOEHRING HEAVY DUTY

Write for Crane Excavator Bulletin No. Cr.32.

KOEHRING COMPANY

PAVERS, MIXERS—GASOLINE CRANES, DRAGLINES AND SHOVELS

MILWAUKEE, WISCONSIN

Sales Offices and Service Warehouses in principal cities

Foreign Dept., Room 1370, 50 Church St., N. Y.
Canada, Koehring Company of Canada, Ltd., 105 Front St., East, Toronto, Ontario.
Mexico, F. S. Lapum, Cinco de Mayo 21, Mexico, D. F.

A2688

Feeding the Giant

COAL is hoisted a ton at a clip, to fuel Marion Model 350, by means of a special hoist operated entirely by one man. Fueling is done without shutting down the shovel. The coal bunker is all steel and extends above the house.

Model 350, the world's largest shovel, is made by the world's largest builder of shovels

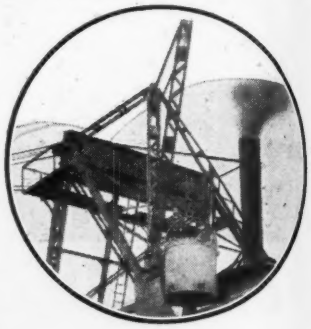
Former method of coaling large revolving shovels consisted of transferring all coal by hand or using an auxiliary crane for lifting skips, cars, buckets, etc. On Model 350, a separate hoist is provided which handles a large bucket holding 1 to 1¼ tons of coal. One man operates the entire mechanism from a platform above the house. The coal bunker is all-steel and extends above the roof to receive coal hoisted in the large bucket.

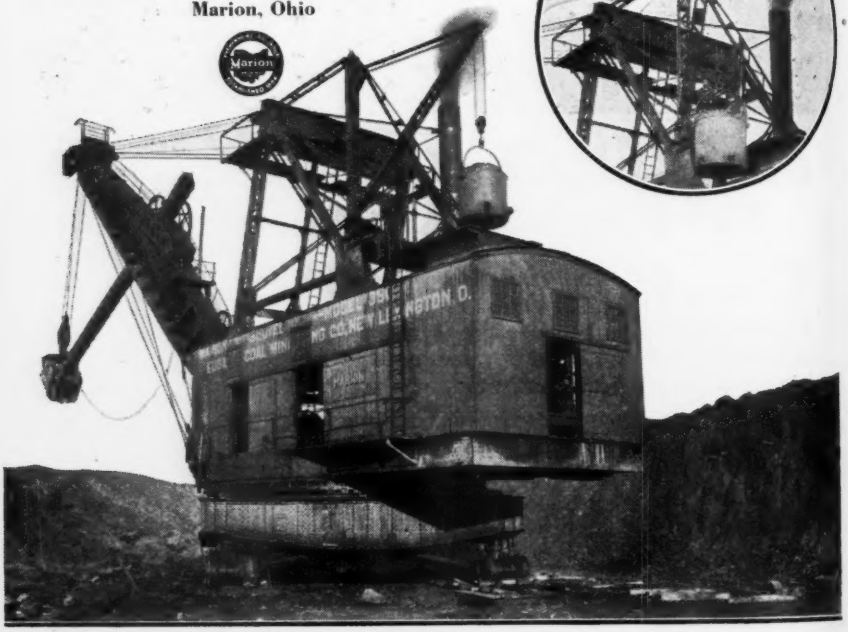
It is not necessary to shut down the shovel to coal up as was formerly the case when coal was put on board by hand or with a crane.

This attachment is standard equipment on all Model 350 steam machines.

The Marion Steam Shovel Company

Marion, Ohio





The hoist on the Model 350 is a self-contained unit consisting of 5½-in. x 6-in. double reversible engine, direct geared to the drum. With a steam pressure as low as 50 lbs. per square inch, the hoist will develop a pull sufficient to lift the loaded bucket.

2404

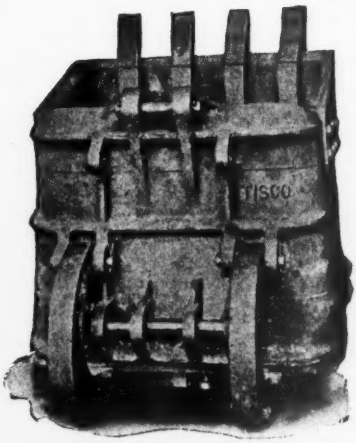
Marion Power Shovels

Taylor-Wharton Iron & Steel Co.

Wm. Wharton, Jr., & Co., Inc.

Tioga Steel & Iron Co.
Philadelphia Roll & Mach. Co.

TISCO



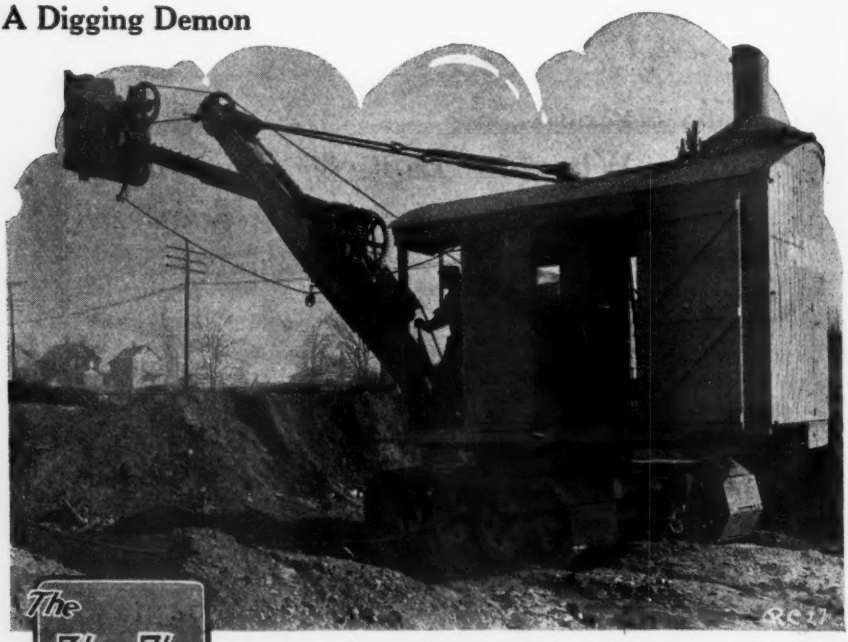
Made in sizes for all Makes of shovels

ONE PIECE DIPPER

These dippers are cast in one piece, and are designed on absolutely correct principals. They may be obtained at practically the same cost as the built-up type. TISCO dippers carry a replaceable lip and are equipped with Van-Port reversible teeth. The teeth are always sharp because by reversing them they resharpen themselves.

Taylor-Wharton Iron & Steel Company
High Bridge, New Jersey

A Digging Demon



The 3/4–7/8 Range

Modern Massillon

Rugged, Hard Digging

The Modern Massillon Steam Shovel is profitable because economical, and economical because of its Low Maintenance, Interchangeable Repairs, Its Power, Strength, Speed, Mobility, Accessibility and Dependability. This is a chain of qualities that meshes up with your maximum possibilities for earning profits, and makes them a reality.

Can be used with clam shell or dragline equipment, or as a locomotive crane. Write for the book that tells how it is constructed.

BUILT BY

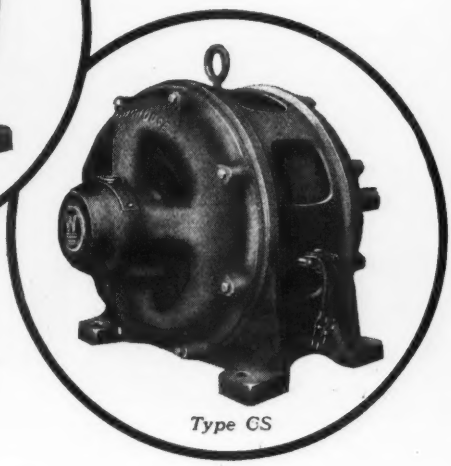
THE RUSSELL & CO.

MASSILLON, O.

(Established 1842)

Type CW

For Driving:
Crushers
Dry Pans
Pumps
Pug Mills
Auger Machines
Fans



Type CS

Masterful Motors

WHEN you install a Westinghouse type CS or CW motor, you find it a masterful motor—master of every situation. Its rigid and sturdy construction enables it to meet every requirement of the severest service.

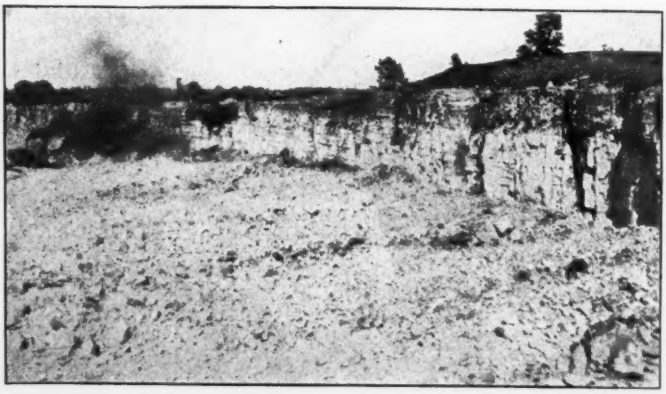
The CS and CW motors are remarkable for their extreme simplicity. The bearings, which are easily interchangeable, have a large surface and are well protected from dust and dirt. Long life and steady operation are assured with these motors.

Westinghouse engineers are at your service in assisting you to select the motor and control equipment for any drive.

Westinghouse Electric & Manufacturing Company
East Pittsburgh Pennsylvania
Sales Offices in All Principal Cities of
the United States & Foreign Countries

Westinghouse

X 80603



RESULTS

GRASSELLI Explosives have earned their popularity with quarry-men by the results they produce. In many quarries where the question of profit and loss has been decided by the success of the blasting operations, Grasselli Explosives have proved their worth.

Regardless of what conditions must be met, or how difficult the blasting problem may be, there's a grade of Grasselli Explosives to fit the job in hand. Each grade is made to do a particular kind of work well—to bring the stone down clean from the face in the size and condition you want for fast shovel work or hand loading.

If you are up against a hard blasting problem, call in a Grasselli Field Man. He will gladly come to your quarry, consult with you and help in selecting the grade of Grasselli Explosives that will give you the results you want.

Talk it over with him. No obligation—just write our nearest branch.

The Grasselli Powder Company

Main Office: Cleveland, Ohio

Branches:
Philadelphia
Bluefield, W. Va.
Birmingham
Wilkes-Barre, Pa.
Brownsville, Pa.

Pittsburgh
Chicago, Ill.
Clarksburg, W. Va.
Pottsville, Pa.
Hazleton, Pa.
New Castle, Pa.

The Grasselli Powder Co. of Florida, Miami, Florida.

GRASSELLI EXPLOSIVES

"Now have 4 WILLIAMS Buckets in service; runs longer than any other bucket, with fewer repairs."—Charles R. Wilson, Wilson Sand & Supply Co., Huntington, W. Va.

For every job, there's a "WILLIAMS" that exactly suits

Whether you have excavating, rehandling, or dredging work, one of the buckets in the Williams line will "fill the bill" perfectly — giving the output you need, and dependable service: **"All parts guaranteed against breakage as long as the bucket is used on the classes of work for which we recommend it."**

If ever in doubt

Let the bucket do the talking!

When you are told that another bucket will give you as much output as the WILLIAMS— *decide by actual performance.*

We are always glad to put you in touch with WILLIAMS users near you who have made careful tests of different buckets, and know from experience which is the best digger.

The extra output of a WILLIAMS power-arm bucket has been proved by thousands of sand and gravel men, *and will be proved on your own work.*

Tell us what kinds of excavating or material handling you have to do, and we will quote you on the WILLIAMS which is guaranteed to move more material. Not just for one day, but every day, month after month.

G. H. WILLIAMS COMPANY, 605 Haybarger Lane, Erie, Pa.

Eastern Sales Office: 30 Church St., New York City

WILLIAMS

FAST-DIGGING BUCKETS

All Parts Guaranteed Against Breakage

NOTICE

Worthington Pump and Machinery Corporation, former manufacturers of the Superior McCully gyratory crusher, brought suit against Traylor Engineering and Manufacturing Company of Allentown, Pa., claiming that the Traylor Bull Dog gyratory crusher built by the latter company is an infringement of United States patent No. 960,231.

Sept. 26, 1923, Judge Dickinson of the United States District Court for the Eastern District of Pennsylvania, handed down a decision sustaining above patent and holding that the Traylor Bull Dog crusher is an infringement.

On Oct. 1, 1924, the United States Circuit Court of Appeals for the Third Circuit affirmed this decision. The Traylor Company then petitioned for a rehearing, and on Dec. 3, 1924 this petition was refused.

The Traylor Company then petitioned the United States Supreme Court for a Writ of Certiorari to review the case, but this was denied March 9, 1925.

The District Court thereupon made its Injunction effective which was served on Traylor Engineering and Manufacturing Company on March 23, 1925, enjoining that company from further infringement by either manufacturing, selling or using crushers covered by claims of the patent.

ALLIS-CHALMERS MANUFACTURING COMPANY OF MILWAUKEE

is the only Company now licensed to manufacture under this patent and only the use of machines manufactured by Worthington or Allis-Chalmers is free from any danger of suit for infringement.

Warning is hereby given against the unlicensed manufacture, sale or use of crushers infringing the above patent.

ALLIS-CHALMERS MANUFACTURING COMPANY
Licensee

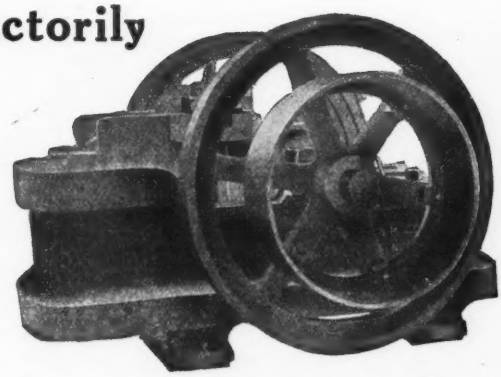
March 23, 1925.

LEWISTOWN FOUNDRY PRODUCTS

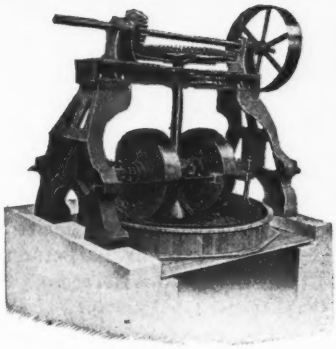
Will satisfactorily meet your

CRUSHING
GRINDING
SCREENING
WASHING
DRYING
ELEVATING

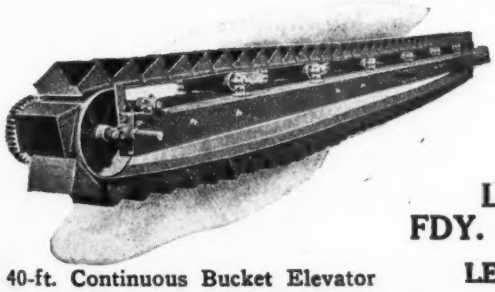
needs



We manufacture a line of equipment for the above purposes in pit and quarry service and shall be pleased to furnish you with any desired information on whatever class of equipment you are interested in.



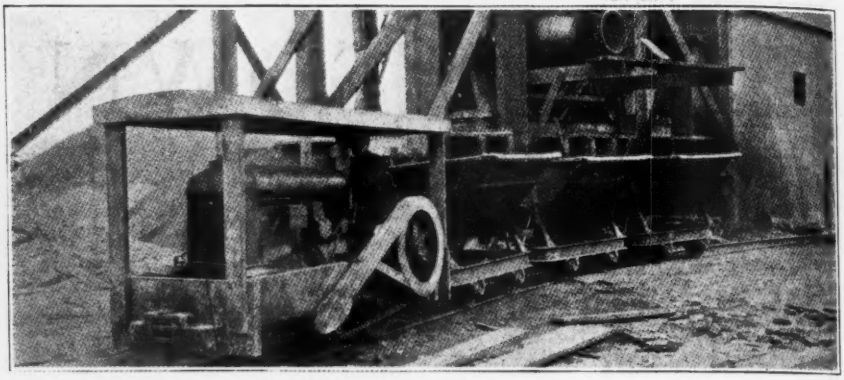
9-Foot Dry Pan



40-ft. Continuous Bucket Elevator

LEWISTOWN FDY. & MACHINE CO.

LEWISTOWN, PA.



High Performance—Low Cost

No better indication of the capacity of Brookville Locomotives to meet all working conditions and requirements, side by side with more expensive locomotives, is found than in the testimony of users. The following from the Wyandot Clay Products Co., Upper Sandusky, Ohio, is a good illustration:

> "We are using both types of your locomotives and are very highly pleased with them. Their upkeep, beyond the gas and oil, has been practically nothing and either one of the locomotives could do much more than we require of it. We consider them a splendid investment.
>
> "Should you desire to refer any parties to us either by mail or in person, we will be glad to give them every consideration."

No matter what Haulage you use, or intend to use, prime yourself with the facts from Brookville. We strictly guarantee satisfaction from all Models for loads and grades within their capacity.

Brookville Truck & Tractor Company

BROOKVILLE, PA., U. S. A.

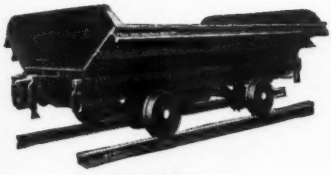
BROOKVILLE

GASOLINE LOCOMOTIVES

Koppel

Your workmen know

The pounding, smashing service encountered in quarry work makes necessary cars of extraordinary strength and resistance.

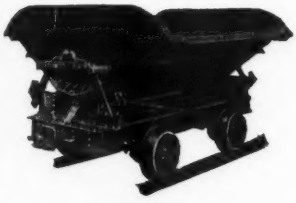


No. 1696

Koppel cars, with a record of many years of experience behind them, have proven their worth in Quarry service.

Made and designed to give wear and long service—they will stand up and work along day after day with a minimum of upkeep.

Write for our latest Quarry Bulletins—now ready for you.



No. 1183

Koppel Industrial Car & Equipment Co.

Koppel, Penna.

RAILS SWITCHES
FROGS TRACK

Sales Offices
Pittsburgh New York Chicago San Francisco

KOPPEL

KOPPEL

WOOD UNDERBODY

A Loyal Employee

Your Wood Underbody Hydraulic Hoist is the most loyal employee you have. It is always on time ready to go to work—never quits until the job is done—and it is never off on "sick leave."

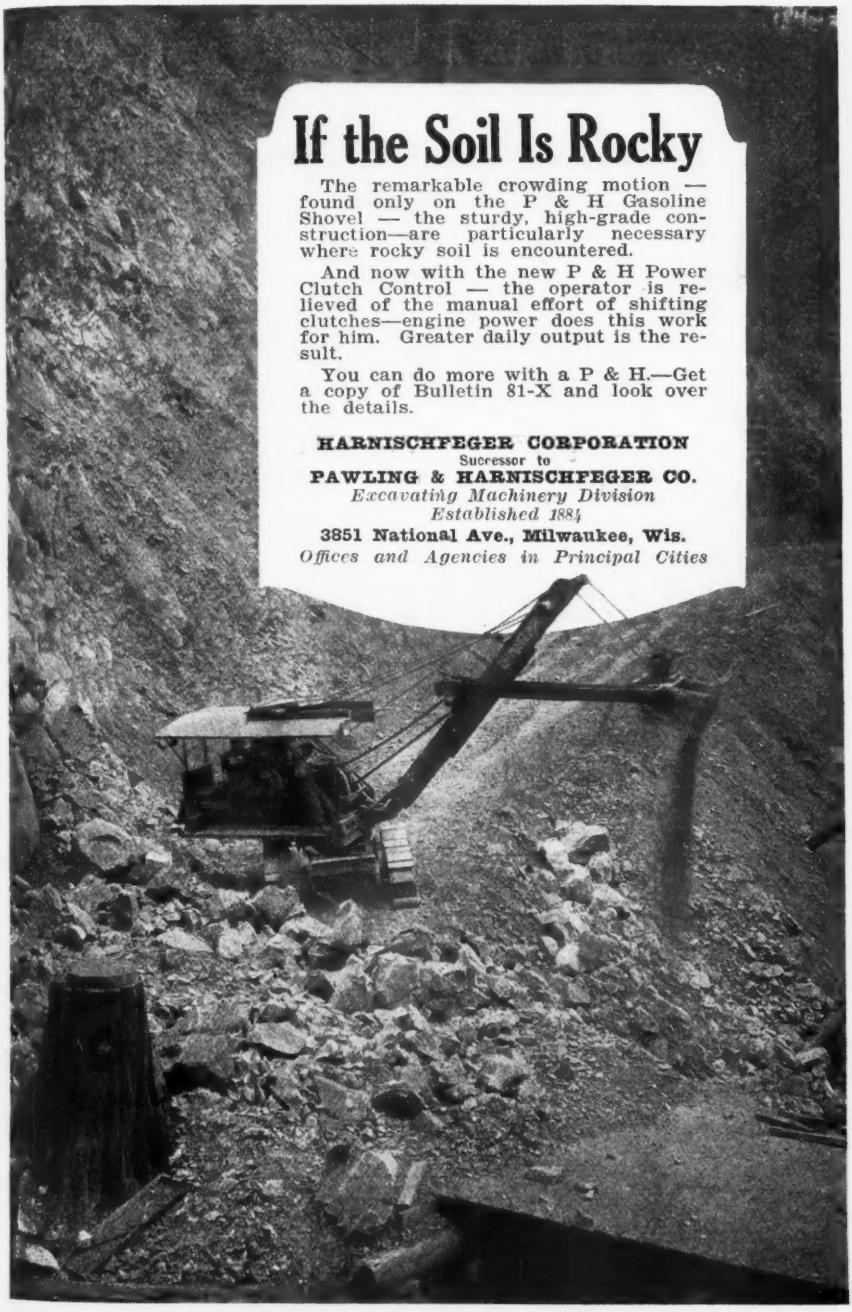
The simple construction of this hoist is responsible for its steady performance day after day. There are only three vital moving parts—a piston and two steel pump gears—and these work in oil.

Put a Wood Underbody Hydraulic Hoist on Your Payroll

WOOD HYDRAULIC HOIST & BODY CO.

World's Largest Builder of Hydraulic Hoists and Steel Dump Bodies

7952 Riopelle Street **Detroit, Michigan**



If the Soil Is Rocky

The remarkable crowding motion — found only on the P & H Gasoline Shovel — the sturdy, high-grade construction—are particularly necessary where rocky soil is encountered.

And now with the new P & H Power Clutch Control — the operator is relieved of the manual effort of shifting clutches—engine power does this work for him. Greater daily output is the result.

You can do more with a P & H.—Get a copy of Bulletin 81-X and look over the details.

HARNISCHFEGER CORPORATION
Successor to
PAWLING & HARNISCHFEGER CO.
Excavating Machinery Division
Established 1884
3851 National Ave., Milwaukee, Wis.
Offices and Agencies in Principal Cities

P&H GASOLINE SHOVEL

Are you prepared for a busy season?

Your best preparation is by making replacements with 'ERA' Manganese Steel. It wears longer.

Last year many an operator discovered that he was not as well prepared for a heavy season as he had imagined. He may have made adequate replacements of worn equipment but along about August things began to happen—breakdowns, delays, rush orders for new parts and a resulting loss of time and money.

'ERA' Manganese Steel-parts because of their greater toughness and much greater durability, reduce those expensive midseason delays to a minimum.

We have persistently held a stable price to insure a stable quality.

MANGANESE STEEL
ERA
THE FIRST - STILL LEADS IN QUALITY

THE HADFIELD-PENFIELD STEEL CO.
BUCYRUS, OHIO

TELSMITH

A Specialist in Gravel Plant Machinery—

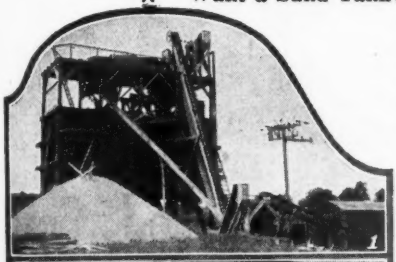
Want a Crusher? The Telsmith Primary Breaker excels in crushing gravel boulders. The "parallel pinch" prevents slippage. Telsmith is equipped with steel frame, steel crown and rigid shaft—all guaranteed for two years, even against breakage by tramp iron.

Want a Washer? The Telsmith Heavy-Duty Washing Screen washes and screens in one cylinder; saves headroom; saves floor space; saves water. It washes anything that is commercially washable.

Want a Sand Tank? The Telsmith Tank is guaranteed to work automatically all day, every day, without labor or even supervision. De-waters within 25%, discharging only 5% free water.

Want a Feeder? The Telsmith Plate Feeder assures a steady flow of aggregate, increasing your daily output, improving your product, cutting your cost per yard. Adjustable for any desired yardage.

Want a Complete Plant? The Telsmith organization offers you complete service, centralized responsibility, the best engineering experience, the guarantee of a strong, reliable company. Glad to send you bulletin No. GP-15.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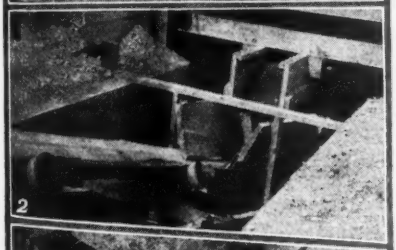
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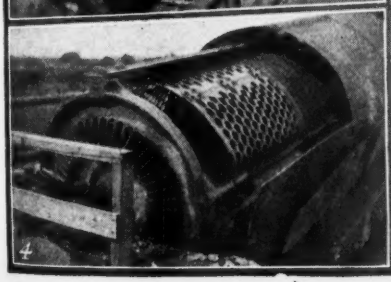
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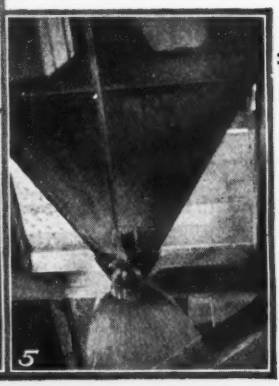
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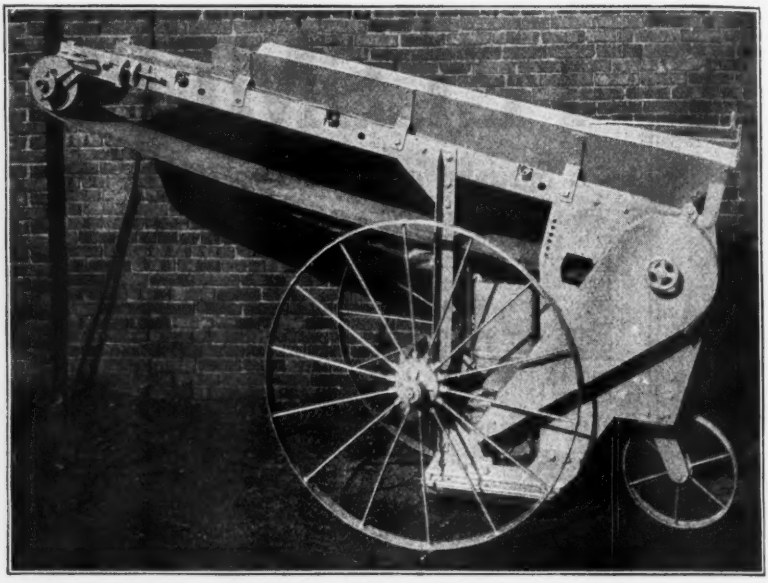
Smith Engineering Works
3183 Locust Street
Milwaukee, Wis., U. S. A.

Old Colony Bldg.
Chicago, Ill.

18 E. 41st St.
New York City

Beckwith Machy. Co.
Pittsburgh and Cleveland



Increased Production—Reduced Cost

The use of Ottumwa Box Car Loaders means a double saving from the high cost of production. Increased production results from their use, and the decreased operating cost resulting from the elimination of labor means a double profit to the user.

The Ottumwa Box Car Loader is efficient and economical in loading sand and gravel, crushed rock, phosphate, concentrates, fertilizer, gypsum, bulk lime, cement, coal, ores and similar materials. The conveyor is adjustable.

One user says: "Loading approximately 30 tons per hour in box cars which the loader handles without any difficulty."

The Ottumwa is manufactured with electric or gasoline power and the motor or engine is protected from dust, dirt and grit. Roller and ball bearings throughout, latest improved Alemite Greasing System.

The Ottumwa will put dollars in your safe. Write for full information.

OTTUMWA BOX CAR LOADER CO.

OTTUMWA, IOWA

Making Cheaper GOLD

" 'way back from the beaten path" Manley O'Reilly Gold Mines, Ltd., Boston Creek, Ontario, needed an economical source of power, of proven reliability -- portability -- low operating cost -- using a conveniently portable fuel and little of it, so they chose a compressor driven with a Waukesha "Ricardo Head" Motor. Thirty-two other industries use them in powers from fifteen to a hundred horse.

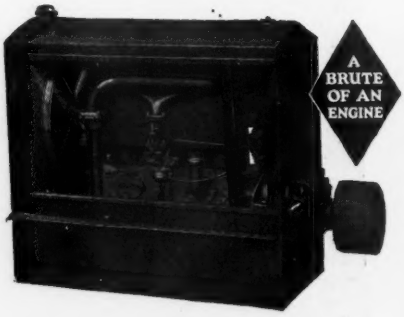
We have a Unit just the right size for your job; also two books for you— "Waukesha Power Units" and "Ricardo Head Principles." Write us and we will have our nearest representative help you.

WAUKESHA MOTOR COMPANY

Waukesha, Wisconsin

Eastern Sales Office *Aeolian Building, 33 W. 42nd Street* *New York City*

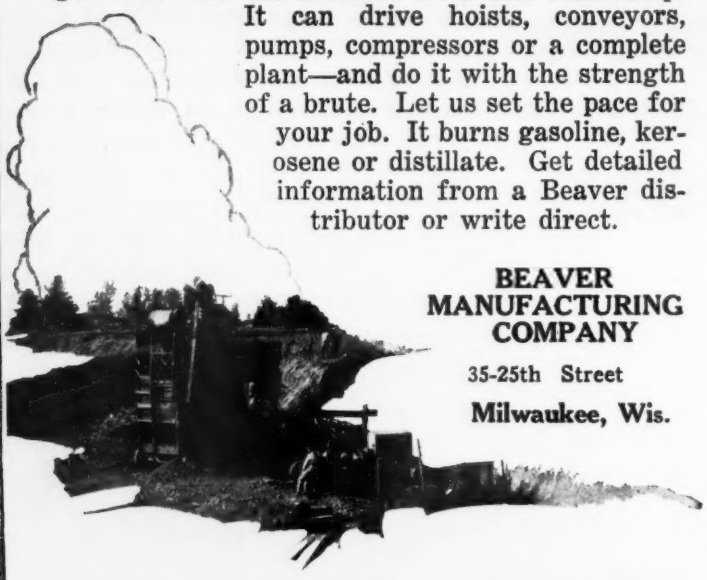
Beaver Power Unit is made for heavy service. It is protected by an all-steel housing which does not interfere with the accessibility of working parts.



Powers Your Pit!

There is a great satisfaction in knowing a power unit is dependable. That it will work consistently where and when you need it. For the Beaver Power Unit, that's the sum and substance.

It contains a deep breathing valve-in-the-head engine built for the severest work and leadership. It can drive hoists, conveyors, pumps, compressors or a complete plant—and do it with the strength of a brute. Let us set the pace for your job. It burns gasoline, kerosene or distillate. Get detailed information from a Beaver distributor or write direct.



BEAVER MANUFACTURING COMPANY

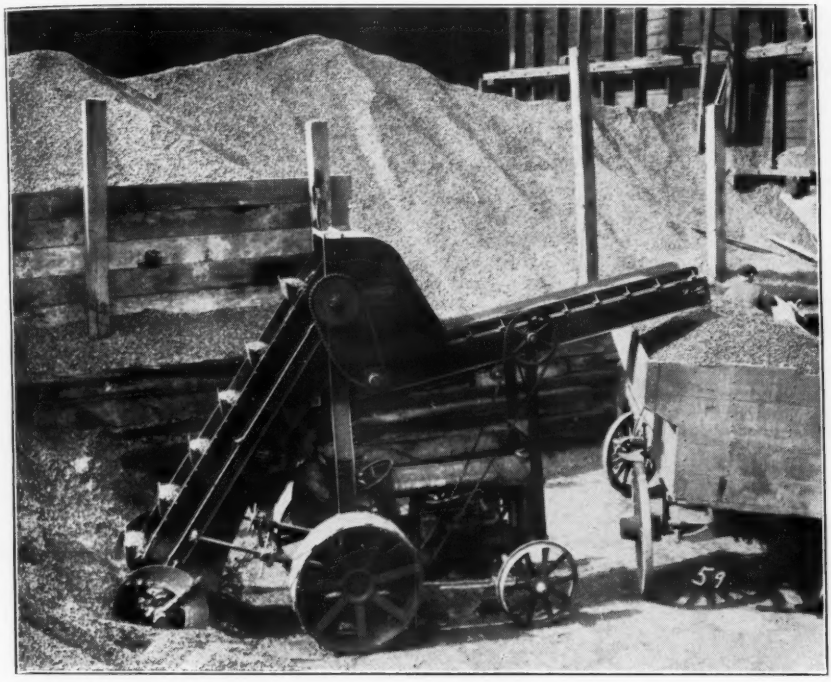
35-25th Street

Milwaukee, Wis.

FOR STEADY SERVICE

Beaver

Loading Costs—and the Specialty Loader



The Specialty Fordson Loader is self-feeding and crowds Two features that smash down loading costs

The Fordson type loader, which means a reasonably priced loader, the improved Specialty Fordson Loader has cost cutting features that mean a big saving in loading costs.

It crowds. It feeds itself. It will crowd when buckets are in operation independent of reversing gear. And it can be crowded at will of operator for two inches or up to any distance. Crowding mechanism is self contained with gears running in oil.

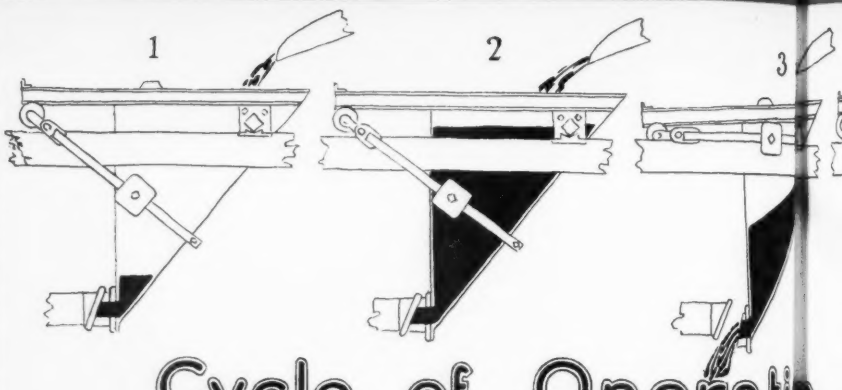
Write for bulletin, or see any Ford Dealer.

Specialty Engineering Co.

ALLEGHENEY AND TRENTON AVES. PHILADELPHIA, PA.

S-A SETTL

Separates Clean Sa



Cycle of Operati

The sand and wash water empty into this tank in such manner that the loam and debris are sluiced away while sand settles to the bottom.

One end of the tank rests upon knife edge pivots. The other end is supported by two counterweighted levers. These counterweights hold the bottom opening against a stationary valve cushion. When the sand reaches a certain point it weight swings the tank away from the valve cushion, sand empties and the tank swings back for more.

Write for quotation on tanks, screens or a completely equipped S-A Plant for Washing and Screening Sand and Gr

Stephens-Ad

Auro Illin

Designers and Manufacturers of L Savi

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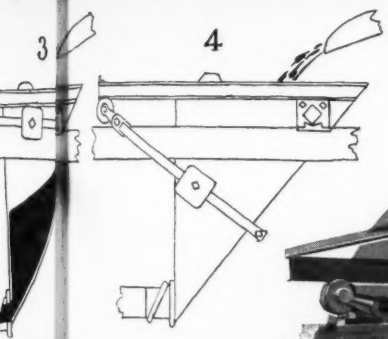
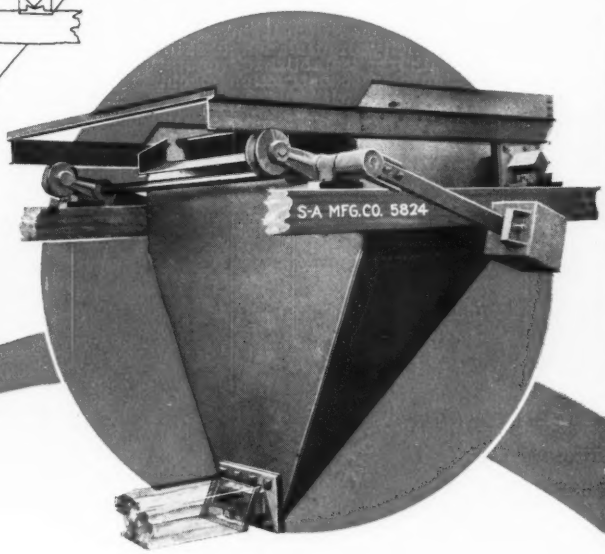
TTLING TANK

Sa from the Wash Water





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Adason Mfg. Co.

Auro Illinois

of Lifting, Material Handling Machinery

A Dollar and A Dime

BOTH a dollar and a dime have their work to do. Well invested, the dollar does ten times the work of a dime and earns ten times the return. Idle or only working part time, its value shrinks and its earning power is wasted.

It is as wasteful for a dollar to do the work of a dime as it is impossible for a dime to do the work of a dollar.

Apply this principle to the field of excavating machinery and the answer is—

The Insley Excavator

A SMALL MACHINE, designed to meet the needs of the lighter class of excavating work—street and road grading, sewer and drainage ditching—it will make more money for you when it is constantly operated to its capacity than a large and expensive machine standing idle half the time.

Its economy of operation is in keeping with its low first cost. Its simplicity of design and skillful workmanship are in keeping with the established reputation of its manufacturers for high class construction machinery. And its speed of operation together with rugged performance make possible performance which is out of all proportion to what you might be led to expect of a small machine.

Made with interchangeable Shovel, Crane, Ditcher and Skimmer Scoop Attachments, it is suited for any sort of light excavation and material handling. It is a value you cannot afford to overlook.

INSLEY MANUFACTURING CO.

Engineers and Manufacturers

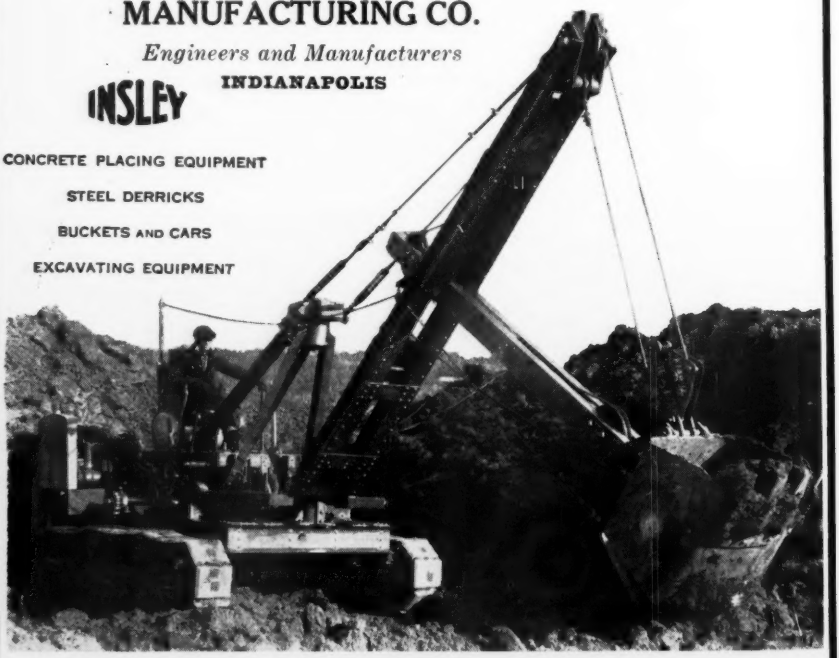
INSLEY INDIANAPOLIS

CONCRETE PLACING EQUIPMENT

STEEL DERRICKS

BUCKETS AND CARS

EXCAVATING EQUIPMENT



Buda-powered Insley Excavator, built by the Insley Manufacturing Company, Indianapolis

A Versatile Piece of Machinery

There aren't many jobs in the excavating line that this Buda-powered Insley Excavator isn't equipped to do—and do quickly and cheaply.

By changing the boom it may be used for shovel, ditcher, or skimmer scoop work. Because of its mobility and speed of operation it can finish the job and get away just as quickly as a larger and more expensive piece of equipment.

The nature of this work calls for an engine of more than ordinary stamina, power and efficiency. Hence the selection of the Buda.

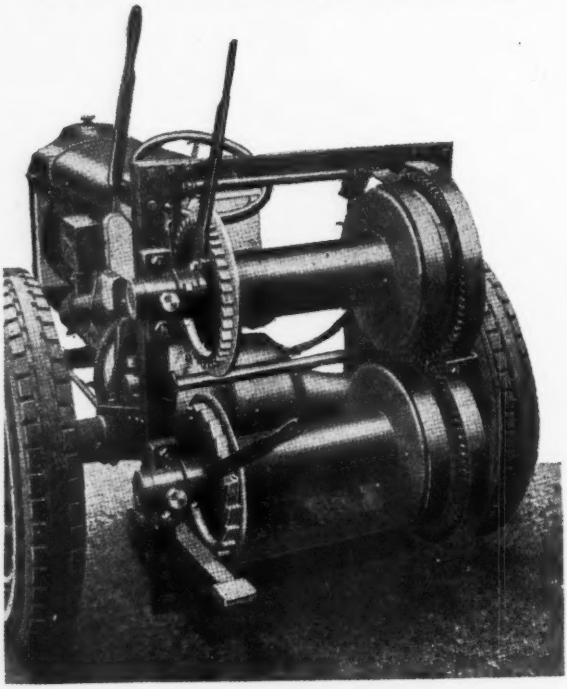
THE BUDA COMPANY, HARVEY CHICAGO SUBURB ILL.
ESTABLISHED 1881

Buy only genuine Buda Parts for your Buda engine
New Parts Catalog No. 432 now ready

BUDA
The
ENGINE

Continental Winches

Speed—Durability—Economy



THE CONTINENTAL DOUBLE DRUM FRICTION DRIVE WINCH

ESPECIALLY adapted to the Fordson Tractor, Continental Winches make an ideal power hoisting unit for dragline cableway, and scraper.

Continental Winches are made in two types—friction drive or gear drive—and come in two sizes—single and double drum. Speed ranges from 60 to 200 feet per minute on all lines. With a motor speed of 1,000 R. P. M. and a load of 3,300 pounds, a speed of 200 feet per minute on the line can be had; other speeds and loads in proportion.

Every Continental Winch is unconditionally guaranteed against defective workmanship and material if reported to us within ninety days after delivery, and any defective part will be replaced F. O. B. Memphis, without charge.

SPINKS SUPPLY CO.

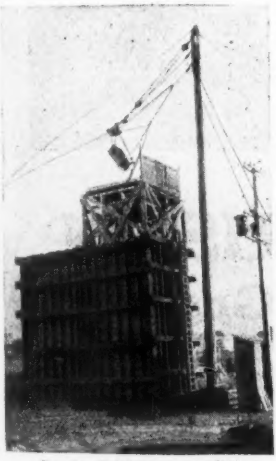
MEMPHIS, TENN.

"—Service of this kind keeps the gravel man operating"

GRAVEL men who make money know how important it is to *Keep operating.* That is one reason why Sauerman Slackline Cableway Excavators are popular at successful gravel plants.

Sauerman cableways can be depended on to dig and convey sand and gravel for month after month with low maintenance expense and minimum loss of time.

The equipment is simple in construction, moving parts are few, and chain connections are extremely flexible. It is this simplicity that enables the Sauerman cableway to operate steadily and cheaply under the strain and wear of gravel pit operation. Abrasion and bending of cables are reduced to a minimum, and all parts give maximum service under hard usage.

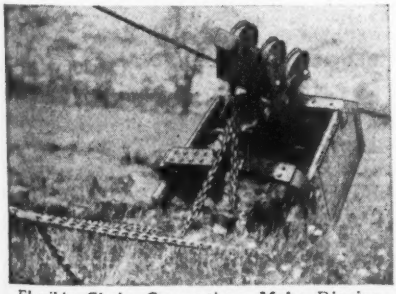


Small Cableway at 200 Yard-per-day Plant.

And in the words of a Sauerman cableway user: "It's this kind of service that *keeps the gravel man operating.*"

Submit your excavating and conveying problems to Sauerman engineers, who will be glad to assist you in preparing a proper layout of equipment. Or if you wish general information, write for Pamphlet No. 22.

SAUERMAN BROS., INC.
434 S. Clinton St. Chicago



Flexible Chain Connections Make Digging Easy.

This 1-yard Cableway Handles 500 Tons Daily.

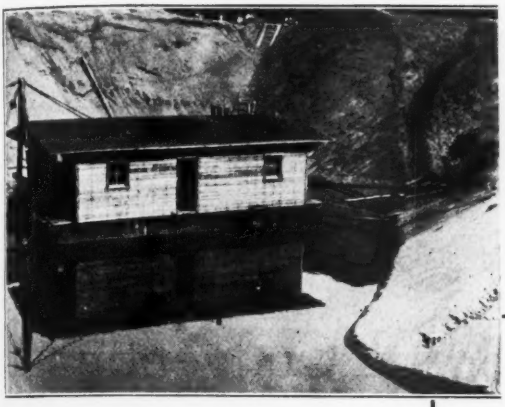
RE-HANDLING EXCAVATING

MEAD MORRISON
Double Duty Grab

The Mead-Morrison Type "W" Universal Grab—light, fast and powerful, rehandles and excavates equally well. When it lands the jaws hit first. They *dig down deep as they close* and fill the bucket for a capacity load every trip.

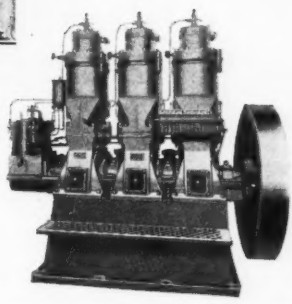
If *one double purpose* bucket instead of *two single purpose buckets* sounds like an interesting saving in equipment get in touch with our nearest office.

MEAD-MORRISON
MANUFACTURING COMPANY
428 PRESCOTT ST. EAST BOSTON, MASS.
Branch Offices: New York · Montreal Chicago



Clean Combustion

Low Compression



Economy Is a Relative Term

THERE IS A GREAT DIFFERENCE IN THE COST OF OPERATING OIL ENGINES

Complete combustion at low cylinder pressures and the two cycle simplicity of the type "D" Venn-Severin Engine practically eliminates repairs and shut-down.

The parts cost is greatly reduced.

The saving in interest charges on the initial installation or investment cost often compensates the whole fuel cost compared with necessarily higher priced, higher compression engines.

Complete combustion implies not only maximum fuel economy but also constant efficiency over indefinite periods of operation.

Write for type D Bulletins. They explain thoroughly the money saving features of this engine.

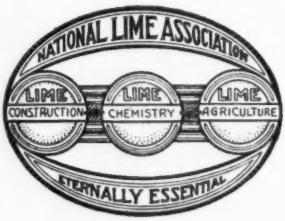
VENN-SEVERIN MACHINE COMPANY

1317 WEST NORTH AVE. CHICAGO, ILLINOIS

NATIONAL LIME ASSOCIATION

Seventh Annual Convention

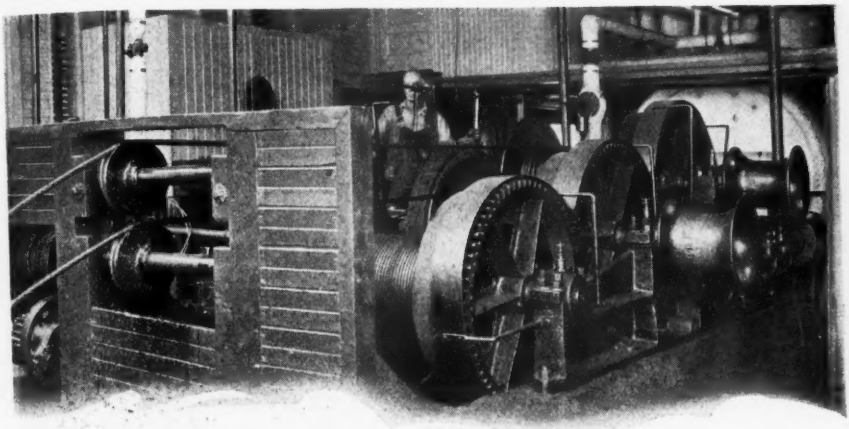
BRIARCLIFF LODGE
at Briarcliff Manor, N. Y.
May 26, 27, 28, 29, 1925



Twenty-third Annual Meeting of Lime Manufacturers

National Lime Association
918 G Street, N. W.
Washington, D. C.

This page donated by Pit & Quarry



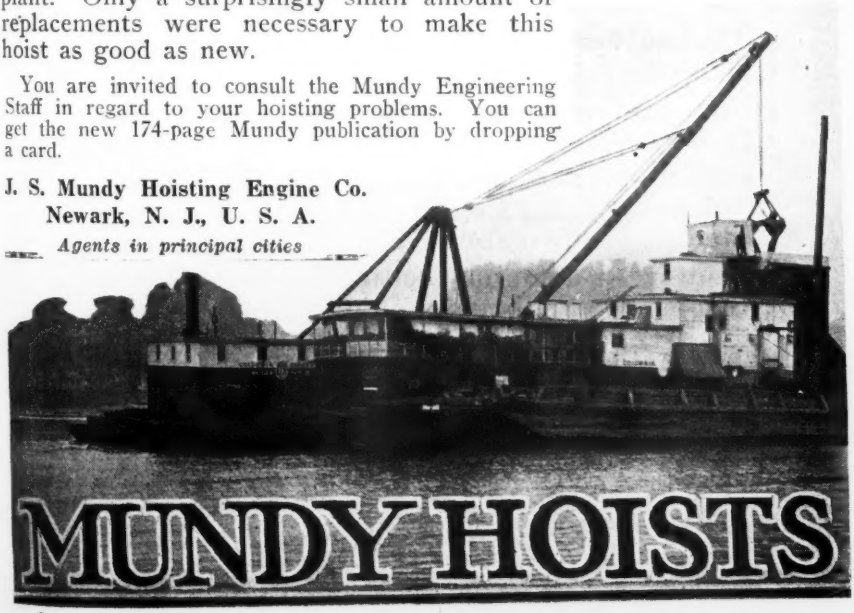
Digging Gravel
From a River Bed

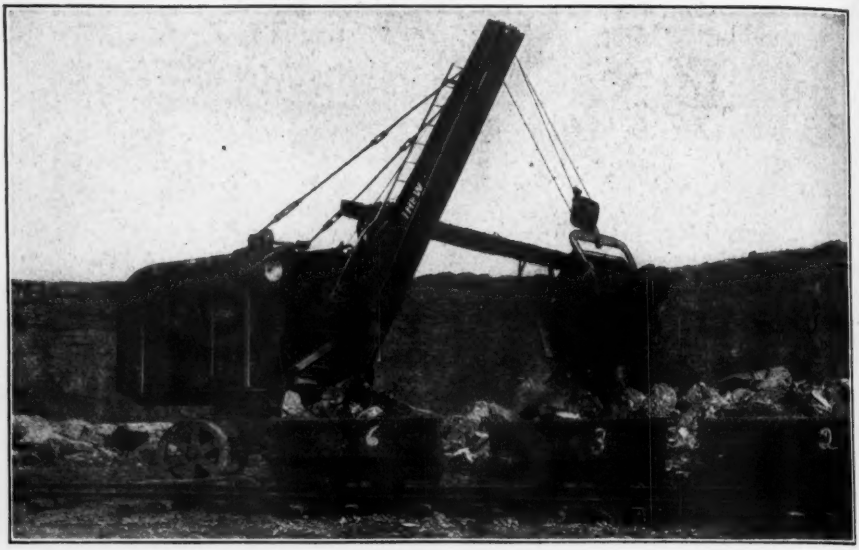
"Excellent Service" says the Superintendent of the Columbia Digger Company of Portland, Oregon, about the three Mundy hoists, that have been in use for the past twelve years on their gravel dredges. This is typical of Mundy Hoisting Equipment. Only a short time ago a Mundy hoist which has operated a pile driver for 31 years was overhauled at the Mundy plant. Only a surprisingly small amount of replacements were necessary to make this hoist as good as new.

MUNDY TRADE MARK ESTABLISHED 1869

You are invited to consult the Mundy Engineering Staff in regard to your hoisting problems. You can get the new 174-page Mundy publication by dropping a card.

J. S. Mundy Hoisting Engine Co.
Newark, N. J., U. S. A.
Agents in principal cities





How to Keep a Shovel Going

The surest way to keep your shovel running faithfully, every day and for years to come, is to select the right shovel in the first place.

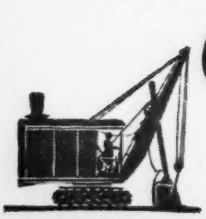
"But how?" you may ask. "What is the best proof of a potential long life?"

The answer is simple. Ask some Quarry men who have used Thews for years.

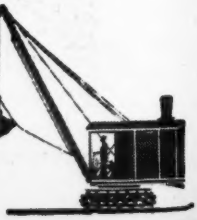
For example, write to the Lutz Stone Company, Oshkosh, Wisc. They bought their first Thew in 1910. In 1924 they bought two more. A Type O Gas and a Type 3 Electric (shown above).

They have definitely settled the problem of keeping their shovels running for many years.

THE THEW SHOVEL COMPANY, LORAIN, OHIO



Thew Power Shovels



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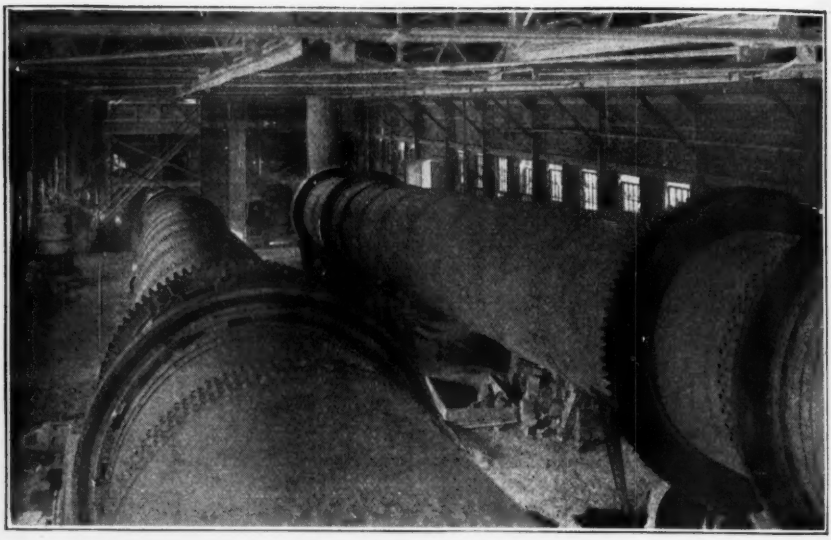
Vulcan
ROTARY KILNS



Vulcan Kilns play an important part in this Company's economy and efficiency

Utilizing waste material in their marble quarrying operations, the Vermont Marble Co. is producing lime efficiently and economically. The plant is equipped to utilize every saving possible; and it is significant that Vulcan Rotary Kilns were chosen to further this plan of economy and efficiency.

There is a real reason for any company choosing Vulcan Kilns. They have made and earned a reputation for efficiency and economy under the trying conditions found in both lime and cement plants. Seventy years of successful operation, improvement and engineering knowledge is behind the Vulcan Rotary Kilns of today.

To any engineer or plant contemplating the installation of kilns, we can be of valuable assistance. At your service any time.

VULCAN IRON WORKS
WILKES-BARRE, PENNA.

Builders also of The Incomparable Vulcan Locomotive

New York Office 50 Church Street
St. Louis Office 1009 Federal Reserve Bank Bldg.
Chicago Office 913 McCormick Bldg.

Pit and Quarry

A Semi-Monthly Publication for Producers and Manufacturers of Sand, Gravel, Stone, Cement, Gypsum, Lime and Other Non-Metallic Minerals.

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Publishers of
PIT AND QUARRY and Pit and Quarry HANDBOOK

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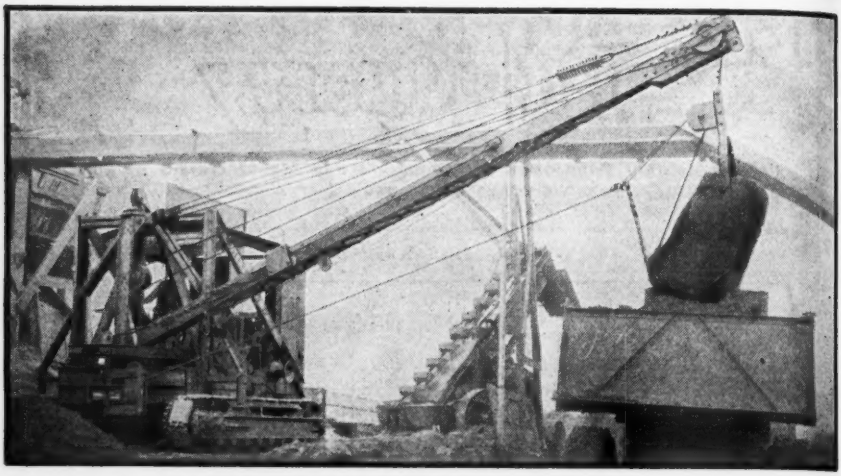

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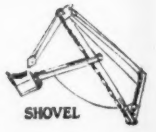

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Pit and Quarry

Vol. 10 Chicago, Ill., April 15, 1925 No. 2

Goodwill In Industry

MAINTAINING mutual good will throughout the organization is one of the fundamental requirements of good management. Laborers cannot be looked upon as a commodity to be purchased, measured, and adjusted for efficiency, nor can they be treated as pampered children, to be coaxed into good humor. No one can evade the fact that there are deep rooted antagonisms between employer and employee as factors in industrial life. There seems to be an element of friction in many other relationships also, as, for example, between landlord and tenant, borrower and lender, and even buyer and seller. All forces of nature, in fact, function as a result of a law of opposites. Centrifugal and centripetal forces, positive and negative, heat and cold, friction and lubrication, inertia and motion are some of the innumerable examples of this law of polarity throughout the universe. The problem of the executive is to effect practical reconciliation of opposing interests in order to secure efficient operation. The antagonistic forces must be combined into a working industrial organization.

The executive who desires to build up a foundation of goodwill in his organization should first determine upon the points of common interest. Then these should be developed and increased until a structure has been made so strong that conflicting interests cannot weaken it. It can never be built upon gratitude, domination, or force; it is an attitude of mind. There is in every human being an instinct of craftsmanship, or constructiveness. It is so fundamental an instinct that it can be traced down through the various forms of animal life, such as the bird, the beaver and the bee. It is a law of nature that this instinct finds a fullest satisfaction when the muscles carry out an idea which has been formed to some extent by the mind. Hence the employer who recognizes craftsmanship as a common interest and permits his employees to share with him the gratification of satisfying that instinct will realize amazing results. He will expend some effort in explaining to the men the principles involved in new operations; he will listen to suggestions from them in regard to methods; he will give some freedom to them in ways of accomplishing certain results; he will thus permit them to enjoy the satisfaction of some self expression. The best way to perform an operation ceases to be the best way if the workman does not want to do it that way. He will want to do it the best way, however, if he has been shown why it should be done that way. The creative urge in him is an instinct and can be utilized in such a manner that production is increased and quality of the output is improved.

Working conditions have much to do with goodwill in industry. Executives who are far seeing recognize that the goodwill secured in this way is worth more than the money expended, that it brings returns measured in terms of profits. Proper safeguards against accidents are now recognized as essential from a practical standpoint. They are not the result of altruism but of common sense on the part of the employer. The day's work is the most important factor in the workman's life. If the conditions under which he works are made as satisfactory as circumstances will permit, he will develop a feeling of loyalty to his company and of pleasure in his work.

Regularity in production is an important factor in the building up of goodwill. The greatest desire of most workmen is a good, steady job. The sense of certainty and of security is very important to all individuals. The steady job for the employee means low turnover for the employer, and hence is a common interest. Irregularity of production, frequent unemployment, and high labor turnover

creates antagonism and ill will. Industry becomes a gamble; it rests upon a shifting foundation, and can look for no stability. Solutions for the problem of the waste of irregular production are constantly being sought. A better organization of sales has been a valuable improvement. Arranging for certain lines of production which can occupy the period between regular activity is advisable. Unemployment is a great waste in industry. Men who are out of work are buying as little as possible; they are deteriorating in skill; they are lowering the standards of the industry; and they are accumulating ill will. Certainty of regular employment is an incentive to efficient work and an assurance of a good morale.

Goodwill springs from respect; it does not result from gratitude. Philanthropy is not what the employee wants; favors do not impress him as of fundamental value. The condenscending attitude brings no valuable results. He wants opportunity for a fair amount of self assertion, a reasonable opportunity for independence. Paternalism has no place in American industry. The workman recognizes good management and respects it. A foreman who is the gruff, hard-as-nails type will win a more loyal support from his men if his craftsmanship and leadership gain their respect than can be coaxed or wheedled out of them by the inefficient foreman who is lavish with compliments and favors. The gruffness is not desirable, but it is outweighed by the qualities which the men admire. Employees know that inefficient management hits back at them; they realize that weakness in production threatens their jobs. They know what a fair deal is and prize it more than inspiration lectures and holiday donations.

The executive who wins the confidence of his men wins their goodwill. Employers of a generation ago believed that they must keep their trade secrets safe from the knowledge of their workmen lest these antagonistic employees use this knowledge against their employer. Suspicion and distrust were never conducive to goodwill. They lead to false rumors and assertions that play havoc with the morale of an organization. A far more wholesome condition is found where the workmen are an informed, intelligent group. In many cases an employer has kept secret the status of his costs, so secret, in fact that he himself has not known the truth of where he stood. There are many situations where the workmen would be more satisfied with their own wages if the business were analyzed by an expert cost accountant and the report made known. Goodwill must be based on a sharing of duties and of responsibilities based upon knowledge.

The solution of the problem of antagonisms between employer and employee will be reached when we realize that the interests of the two cannot be made identical. Rather must a way be found of adjusting these antagonisms in a way that will seem fair and practicable to both sides. An agreement can be reached as to what is the best day's work that can be done without injury to the worker, and what is the highest wage that can be paid without injury to the industry. All conditions of concern to the entire group should be studied and understood in order that policies determined upon may be accepted in good faith. Such a group will work harmoniously for a maximum production because the basic principle of the organizations is goodwill.

The Lime Convention

BRIARCLIFF Lodge at Briarcliff Manor, New York, offers many advantages for holding such a convention as the National Lime Association plan to hold from May 26th through May 29th.

The plan of last year's convention which was held at White Sulphur Springs will be followed this year. This plan which includes ample time for recreation such as golf, tennis, swimming, etc., is commendable. All those in attendance will find common interests both in recreation and the sessions of the convention. Setting aside ample time for recreation assures a maximum attendance at the sessions. Holding a convention at a place such as Briarcliff Manor brings everyone together at recreation. With such a combination everyone present comes in contact with his fellow associate. Another commendable feature of the program will be a Round Table Research Conference on one evening. The value of such an opportunity to exchange ideas is hardly to be measured.

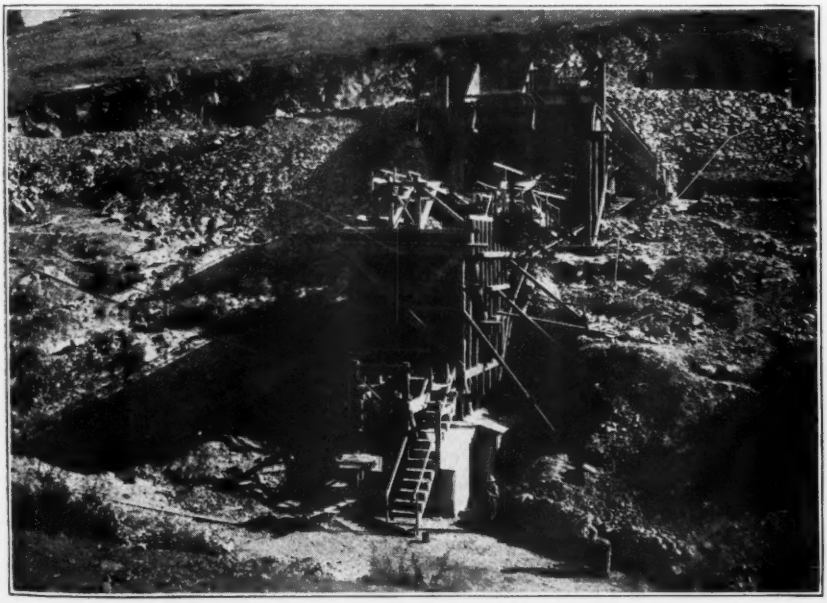
Operating a Crushed Stone Plant Under Unusual Conditions

Automatic Aerial Tramway Conveys Product Over 9,000 Feet Basalt Rock Company Can Ship By Rail, Water and Truck

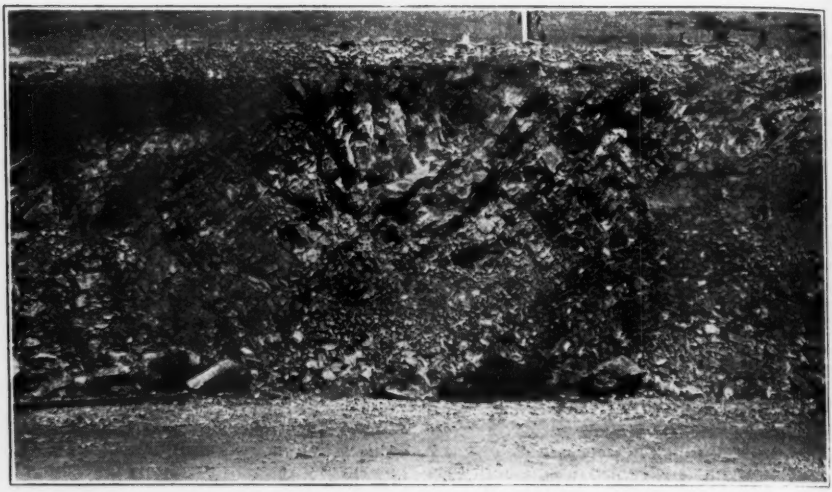
WITHIN two miles of Napa, California, the Basalt Rock Company is operating a crushed stone plant under interesting and unusual conditions. The deposit is located about a third of a mile south of the Asylum lakes. This deposit, which is about 9,000 feet from rail and water, consists of 75 acres of basalt rock of a dark blue color. The formation is in the form of a continuous ledge. The rock has a very close and hard structure and contains lime, alumina, magnesia, iron oxide and silica. The face of the quarry now open shows a cut of 125 feet. The ultimate quarry face when fully developed will be half a mile long and 300 feet high. The hill from which the rock is taken has a rise of about 20 degrees.

The quarry is about 9,000 feet from the railroad and about 300 feet from the main crushing and screening plant. Ingersoll Rand drills and Gardner compressors are used in the quarry. The coyote tunnel method for major blasting has been adopted. The company is now putting off its first blast under the direction of the Hercules Powder Company. It is planned to bring down 100,000 tons of stone.

A Marion electric 1¼ yard shovel loads the stone in the quarry into 6 ton Autocar motor trucks which dump the stone into a number 20 Telsmith gyratory crusher. This crusher reduces the stone to 3 inches. The crushed rock is then conveyed by a 30 inch belt conveyor to a bunker of 150 tons capacity. The stone is fed from this bunker into an automatic aerial tramway which was constructed by the Interstate Equipment Corporation of New York City. This aerial tramway conveys the rock over a hill to the main crushing and screening plant, a distance of about 3,000 feet, where it is dumped into a



Primary Crusher and First Tram Take-Off.

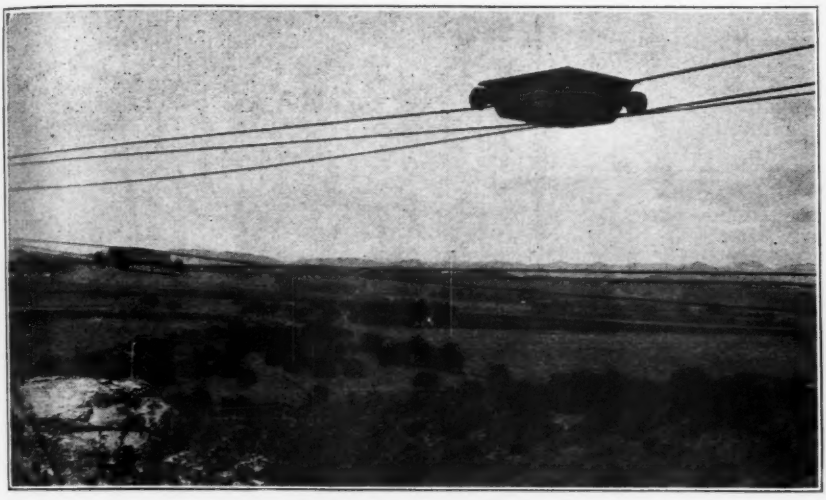


A View of Portion of Quarry Face.

48 inch revolving screen. This screen takes out the rock that is crushed to size and passes it to the sizing screens. The oversize rock is dumped into a bunker which feeds into two number 3 Telsmith crushers. Passing under these crushers is a 30 inch belt conveyor which delivers the recrushed rock to a double bank of Hummer vibrating screens. These screens separate the stone into five different sizes which are stored in their respective bunkers.

Passing under these bunkers and on a trestle over storage piles is a 24 inch belt conveyor with an auto-

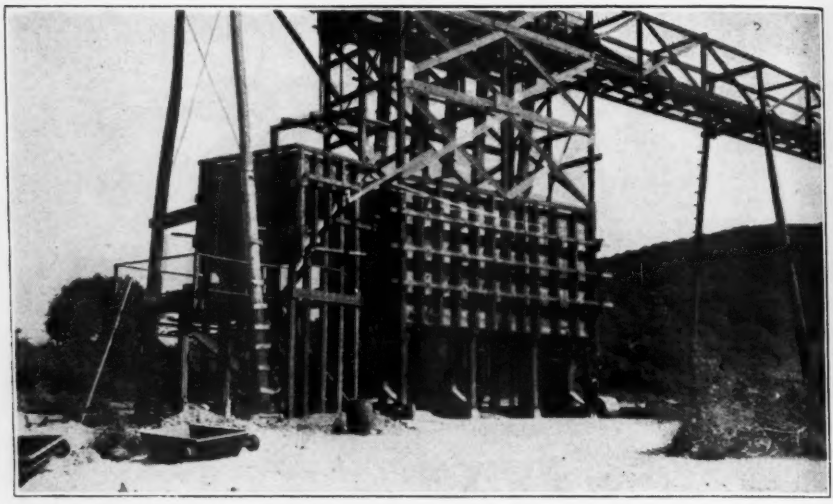
Country Traversed Showing River and Railway in Background, Also the Storage and Screening Plant.



View Showing the Aerial Tramway.

matic tripper which discharges the stone to the various stock piles and to the truck bunkers. Stone for local distribution is delivered from this storage by a fleet of 2, 4 and 5 ton Autocar trucks. Under the stock piles is a large concrete tunnel 6 feet square and 350 feet long. In this tunnel there is another 24 inch belt conveyor, and hoppers are placed every 12 feet through which stone is dropped onto the belt conveyor. With this arrangement it is possible to produce any mixture of stone sizes desired. The belt discharges to a bucket elevator which in turn dumps into a shuttle conveyor. This shuttle conveyor is so arranged that it can

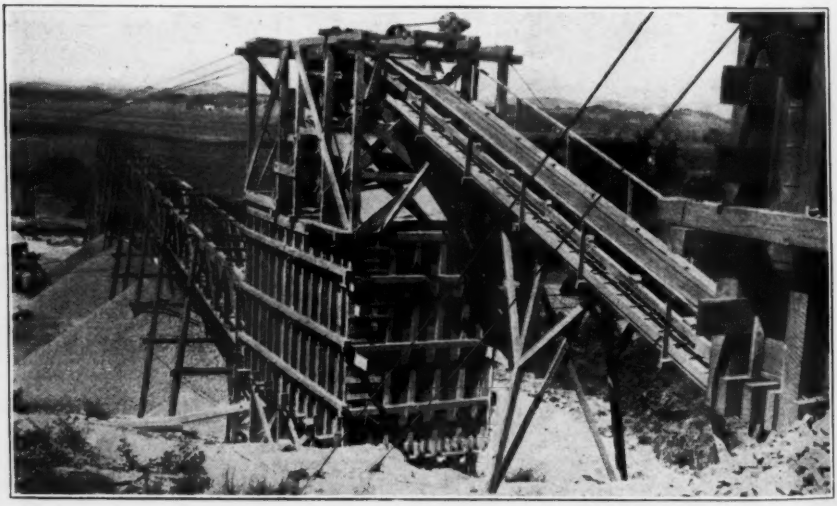
Looking Towards the Quarry—Shortly After It Was Opened.



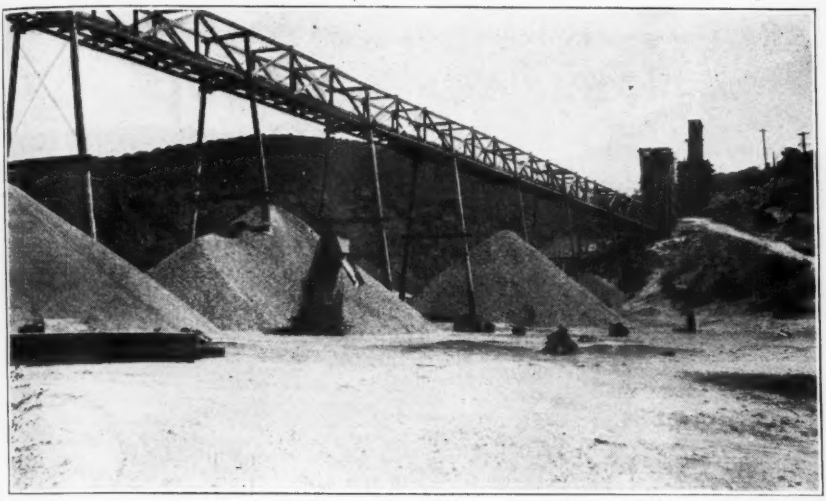
The Truck Bunkers and Second Tram Take-Off.

discharge the stone into the truck bunkers or into a special tramway bunker. This tramway bunker loads a second automatic aerial tramway that conveys the stone about 6,000 feet and discharges either into railway cars or into barges for shipment by water. This second tramway was also built by the Interstate Equipment Corporation.

The Basalt Rock Company is the only crushed stone plant in Central California that is able to ship by rail, water and motor truck. This fact is a tremendous advantage as it enables them to compete for all available business in this part of the state. They have a ready market for their product in San Francisco, Oakland and all the bay cities. In addition they are able to handle business in the interior of the state. They can make rail shipments over the Northern Electric Railway. At the present time the plant is producing 135 tons of stone per hour but the capacity of



View Showing Screening Plant, Sizing Bunker and Outside Storage Facilities.



Showing Storage System—The Tunnel Conveyor Runs Under the Piles.

the plant is 2,000 tons per eight hour day.

The Basalt Rock Company was organized in June, 1923. The company developed from the original L. J. Alexander Company which was organized in 1915 by L. J. Alexander who is now president of the Basalt Rock Company. Mr. Alexander first engaged in the oil business and then entered the crushed stone industry. At first he bought stone and sold it and the possibilities of the crushed stone industry in California lead Mr. Alexander to form a partnership with Mr. A. G. Streblow with the intent of operating a plant. A quarry site was secured and operations started in September, 1920. The demand for stone increased rapidly and it became necessary to organize the present corporation and build the wonderful plant which is now being operated.

Another View of Storage Arrangement Showing Conveyor.

Type of Country Traversed by Aerial Tramway.

Shovel Used in Quarry Basalt Rock Company.

Heil Co., Milwaukee, manufacturer of dump bodies, hydro-hoists and compartment truck tanks, has appointed the Gustav Schaefer Wagon Co., 4166 Lorain avenue, Cleveland, as distributor in the Cleveland territory. Sid Schultze, 128 E. Main street, has been appointed distributor in the Louisville (Ky.) territory.

The Hill Clutch Machine and Foundry Co., of Cleveland, Ohio, has appointed T. L. Rose & Son, 901 House Bldg., Pittsburgh, Pa., as representative in Pittsburgh and adjacent territory.

Harnischfeger Change

The Harnischfeger Corporation (formerly Pawling and Harnischfeger Company) announce the location of a new branch office at Birmingham, Alabama. Mr. James Van Buskirk has been transferred from the Detroit office of this company to take charge of this new office. His office address in Birmingham is 431 First National Bank Building.

Mr. H. E. Mensch has recently been placed in charge of the Detroit office of this company with office address at 452 Book Building.

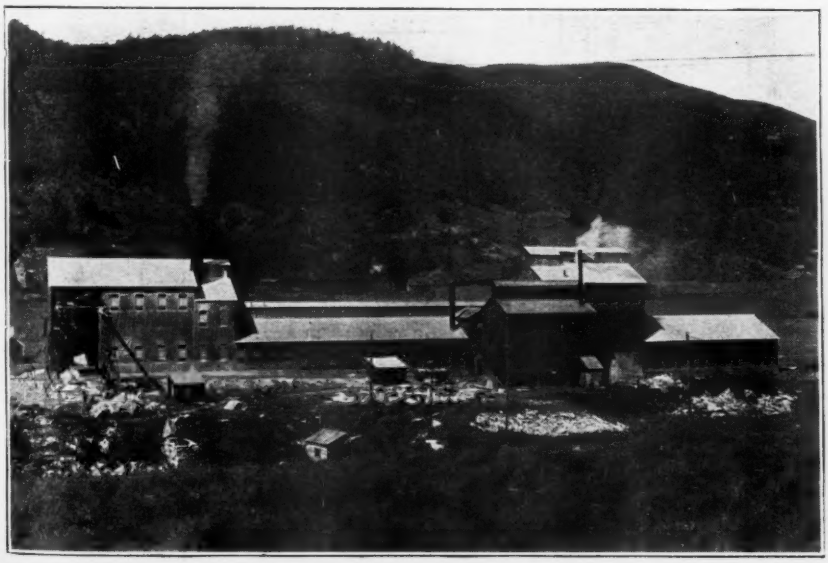
Labor Saving in a Lime Plant Utilizing Waste Marble

Written Expressly for PIT AND QUARRY by F. A. WESTBROOK

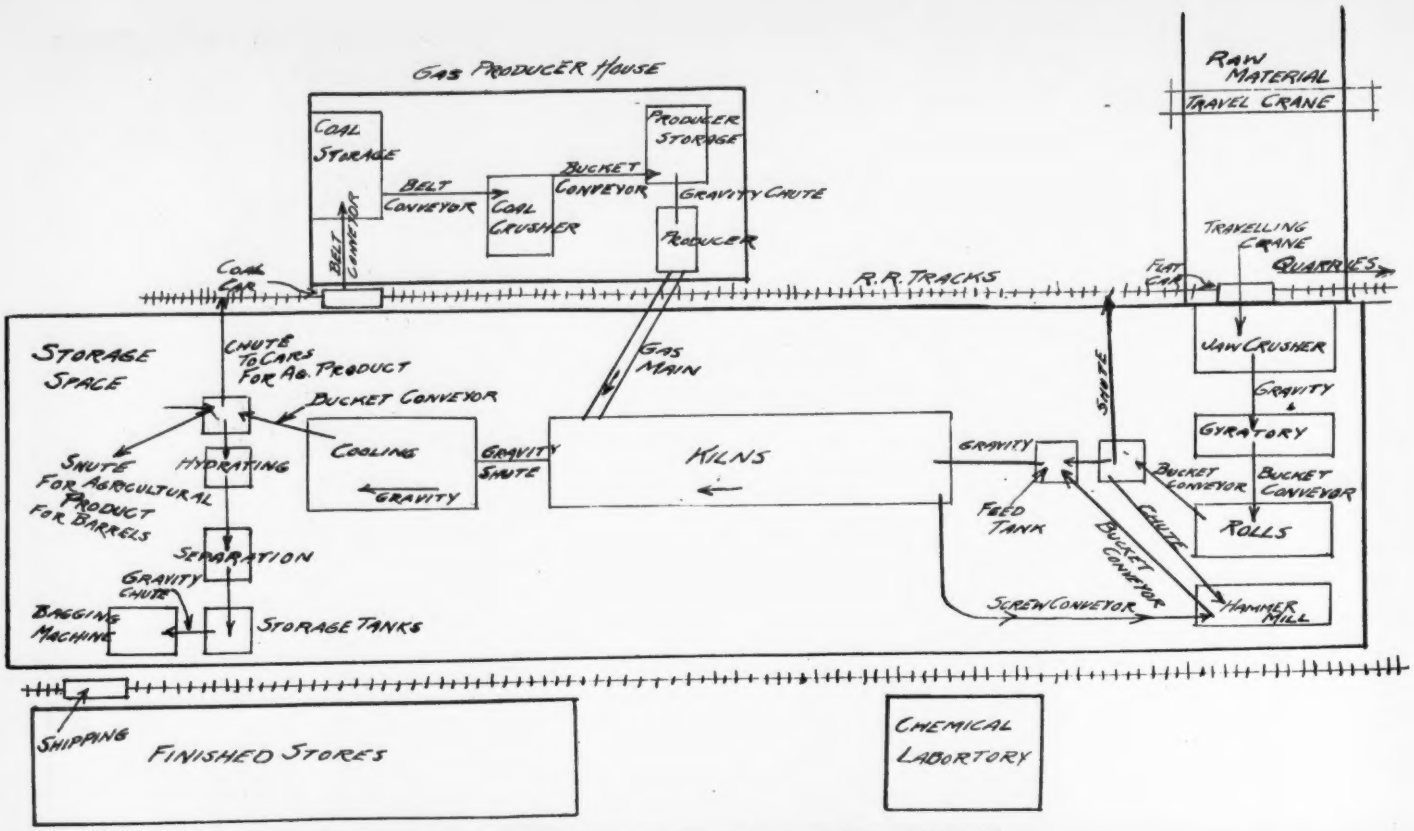
IN THE quarrying of marble, as in the quarrying of other kinds of rock, there is a great deal taken out of the ground which is unfit for building or monumental purposes but which represents a substantial item in the cost of the finished product. In order to turn this item from a loss into a profit the Vermont Marble Company has taken advantage of the fact that lime can be made from marble and has built a lime plant near its large quarries at West Rutland, Vermont. Consistently with this idea of economy and efficiency the plant has been fully electrified and equipped with a series of labor saving devices to which the nature of the product lends itself with peculiar ease. It is a good example of how a series of operations can be carried out from raw material to shipping package without anything but mechanical handling. This mechanical handling applies not only to the manufacture of the lime itself but also to the important subsidiary process of producing gas from coal for heating the kiln.

The lime plant is situated about one mile north of the quarries in the same valley and the otherwise unusable marble is carried to it on flat cars hauled by steam shift engines. Sometimes the rock is in the original quarry blocks of about two cubic yards and sometimes it consists of pieces of refuse from the cutting mills and quarries. In the vicinity of slate or granite quarries, for instance, there are always great piles of unusable stone which not infrequently have to be moved to make room for extending operations of one kind or another. With marble it is possible to get rid of this waste material for good and at a profit.

In the first place, before proceeding to a detailed discussion of the various operations carried on in this plant and of the machinery used to accomplish them, it should be understood that the lime is made in one long main building with the first large stone crusher at one end and the machine for bagging the finished product at the other, with all intermediate processes in between. Electrical power is used exclusively, the movement of material in process of production is shown in the accompanying diagram.



View Showing Plant at West Rutland, Vermont.



Sketch of General Plant Arrangement Showing Flow of Material.

The blocks from the quarries are stored in yards under traveling cranes, as shown in Figure 1, by means of which the heavy pieces of stone are lifted on to the flat cars for transportation to the lime plant. These pieces, if larger than say 3x4x5 feet, must be cut up before feeding into the first crusher. This is done by boring a line of holes with air drills and then splitting with steel wedges. Sometimes this is done right on the flat cars when they arrive at the lime plant, and sometimes in the store yard.

The store yard for the lime mill is adjacent to the first crusher and is also provided with a Whiting traveling crane, of 15 tons capacity, which lifts the stone from the flat cars, places it in some convenient place for future use, or hoists it into the crusher as in Figure 2. From this point on the material is not touched again except by mechanical means until, as finished product, it either passes through a shute into a freight car for shipment in bulk or is bagged in an automatic bagging machine.

The stone goes through two crushers.

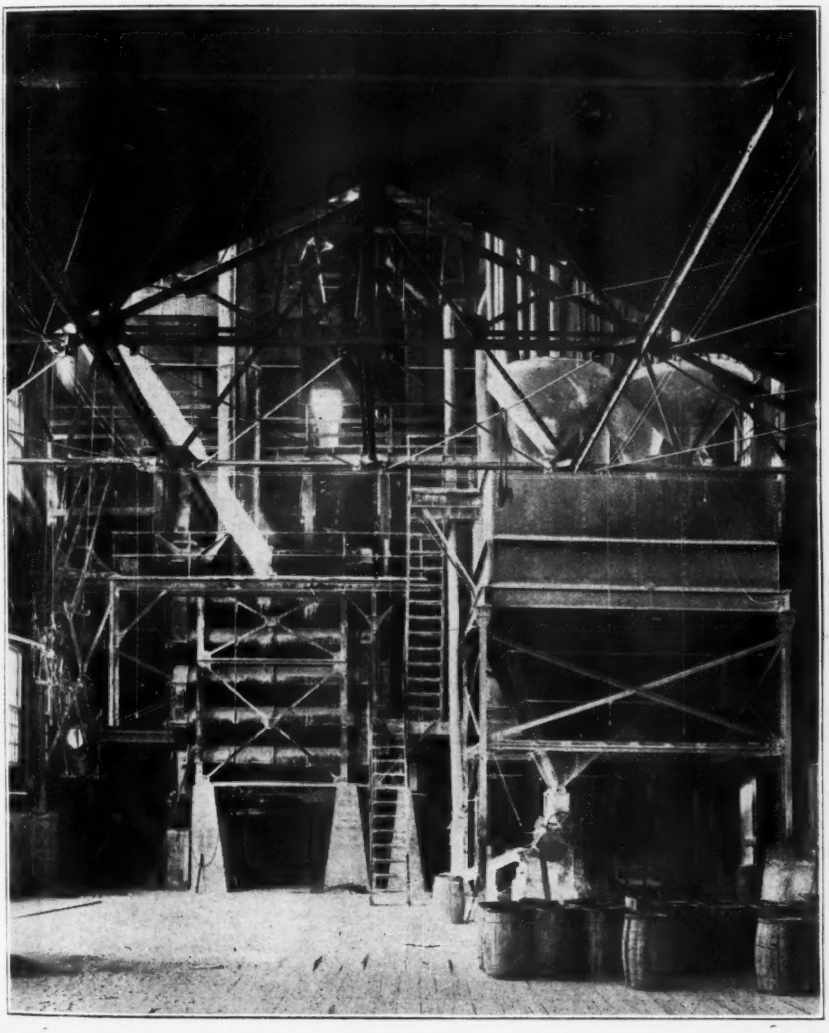


Fig. 6—Hydrating Apparatus in Upper Right Hand Corner—Bagging Machine in Right Foreground.

Sketch of General Plant Arrangement Showing Flow of Material.

The first one is a Power and Mining Company's Superior Jaw Crusher, 48x60 inches, into which large blocks of marble, weighing perhaps several tons, are dropped and broken up into comparatively small pieces. These small pieces drop down (see Figure 2) into a Traylor Engineering Company Bulldog Gyratory crusher which breaks them up into quite small pieces.

The crushed stone is next raised to the top of the building about 35 feet by a Caldwell bucket conveyor having a capacity of 3 tons per hour, to rollers which crush the broken up rock into quite small pieces. These pieces are then elevated about 20 or 30 feet to a distributing tank having three shutes. One of these is direct into freight cars on the siding in case there is an order for crushed stone for road work, etc.; the second is direct to the kiln for the poorer grades of agricultural lime; and the third to the hammer-mill. The stone before it enters the kiln for the best grade of lime for the "burning" process is then raised 45 feet by means of another Caldwell bucket conveyor

Fig. 2—A Large Block of Marble Has Been Lifted by the Travelling Crane from the Flat Car in the Foreground to the Upper Level to be Dropped Into the Jaw Crusher—the Smaller Pieces Which Break Off Slide Down Into the Gyratory Crusher Below.

of 3 tons capacity per hour to storage tanks at the top of the building where it descends, again by gravity, through a shute into the feed tank at the head of kiln. As a considerable amount of powder drops down into the pit at the feed end of the kiln, a screw conveyor has been installed to carry this material back to the hammer-mill and thus avoid waste. This is only used occasionally when there is a considerable accumulation.

"Burning" is carried out in a Vulcan Iron Works kiln which consists of an immense steel tube lined with fire brick 125 feet long and eight feet in diameter which rotates slowly about its longitudinal axis (See Figures 3, 4 and 5). The inside of the long cylinder is lined longitudinally with narrow shelves which, as the kiln revolves, pick up the powder and drop it through the flaming gas. The tube is inclined toward the end where the flames originate so that the powder gradually works downward to a higher temperature until it is finally red hot, the temperature being about 2,000 degrees Fahrenheit.

After having been "burned" by

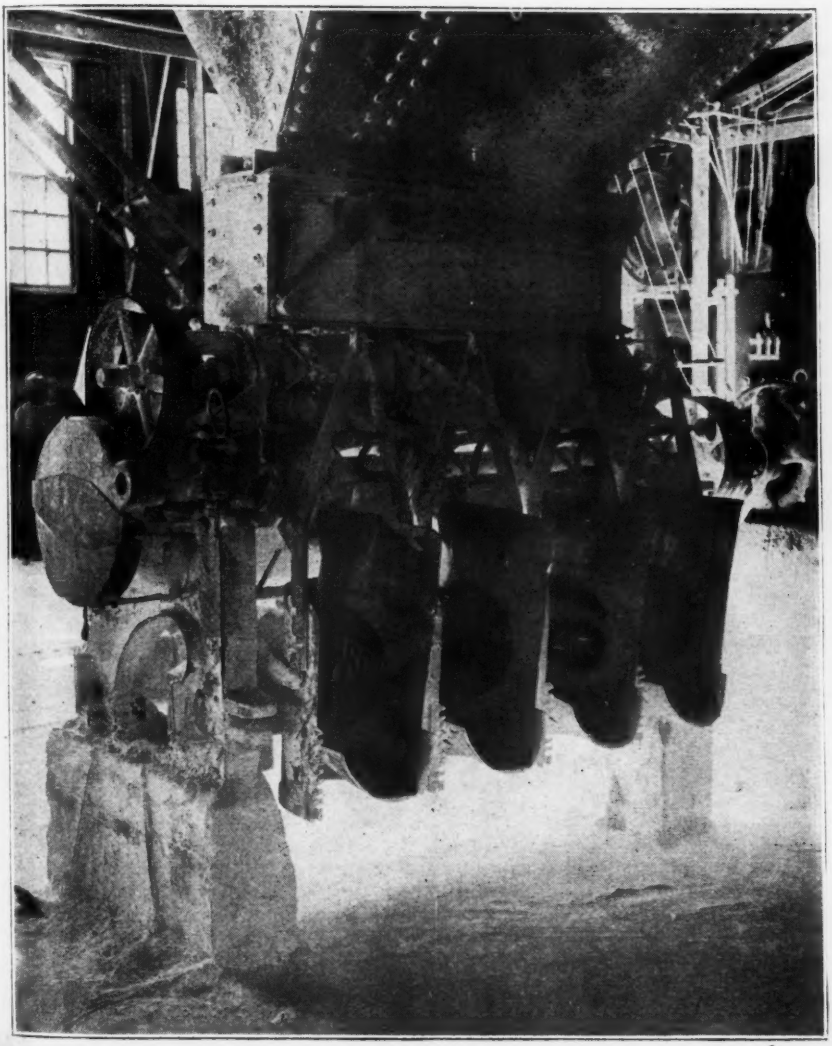
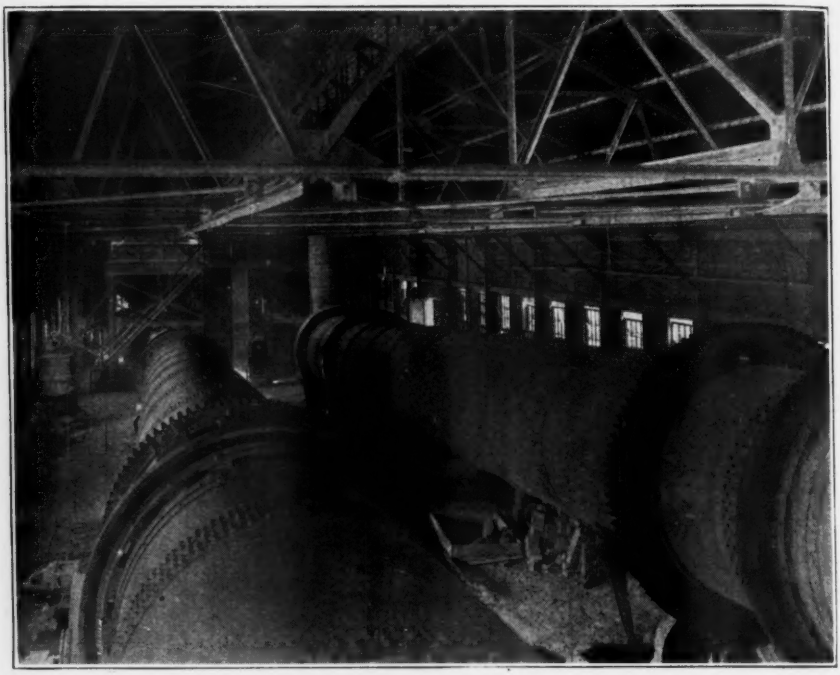


Fig. 7—Details of Bagging Machine Showing Bags in Place.



Showing the Kilns—Heat Is Produced by Gas Flame.

travelling the full length of the kiln, the powder drops down to another rotating tube, but only about half as long as the kiln. This is also inclined and has narrow longitudinal shelves which shift the powder through the cool air and reduce its temperature so effectively that from being red hot when it enters the tube, it is scarcely warm to the touch when

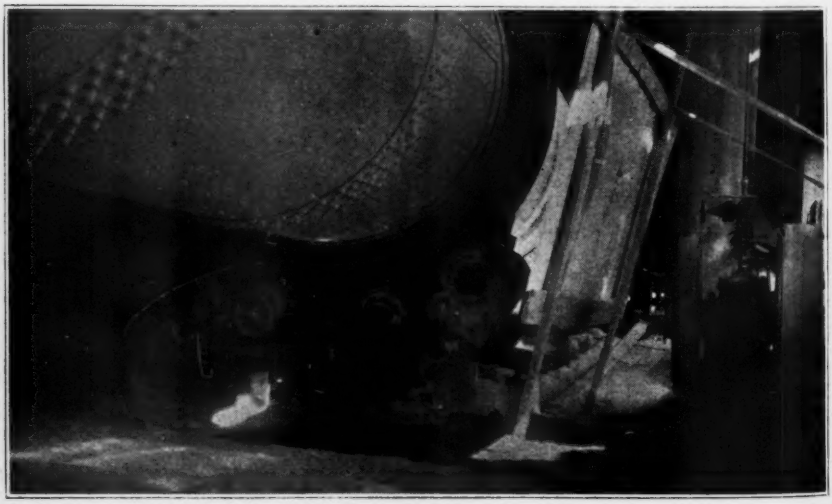


Fig. 5—Detail of Roller Support for Kiln. The Sheet Metal Screen Between the Kiln and Air Compressor on the Right is to Shield the Compressor from the Heat of the Kiln.

it reaches the lower end. The powdered lime is then raised 45 feet by a Caldwell bucket conveyor of about 3 tons per hour capacity to tanks high up under the roof from which it is drawn off through a shute by gravity into the Kritzer hydrating machines, where it is blown through a spray, and then through another shute into centrifugal "separators" to remove the coarse particles. This coarse material is good enough for agricultural purposes while the remainder is used for building purposes. It then passes by gravity through a shute to storage tanks over the Bates bagging machines except where agricultural lime is to be shipped in bulk or barrels in which case it is passed out through shutes directly from the tank above the hydrating apparatus. It is for this kind of lime that the stone is fed directly from the roller crusher into the kiln. Figure 6 shows the hydrating apparatus in the upper right hand corner, and in front and below it, the bagging machines.

The gas for heating the kiln is obtained from soft coal. The gas producer is in a separate building immediately adjacent to that part of the long main building where the kiln is situated. A railroad siding for the convenient handling of coal extends to this building. This producer is a Chapman gas producer.

The coal is handled entirely by machinery. This is shown in the diagram. Belt conveyors of the Stephens Adamson 20-inch type having a capacity of 20 tons per hour, are used to carry the coal from the freight cars to storage and from the storage bins to the crusher. The latter is a Weller double roll crusher and has a capacity of 30 to 40 tons of coal. A Fuller Lehigh Engineering Company bucket elevator of 50 tons per hour is used to raise the crushed coal from the crusher to storage tanks at the top of the producer which was made by the Chapman Engineering Co. The producer itself burns 16 to 20 tons of coal, fed through a shute by gravity to the producer. Although each conveyor has its own motor, an additional motor is provided which can operate either of the belt carriers from the

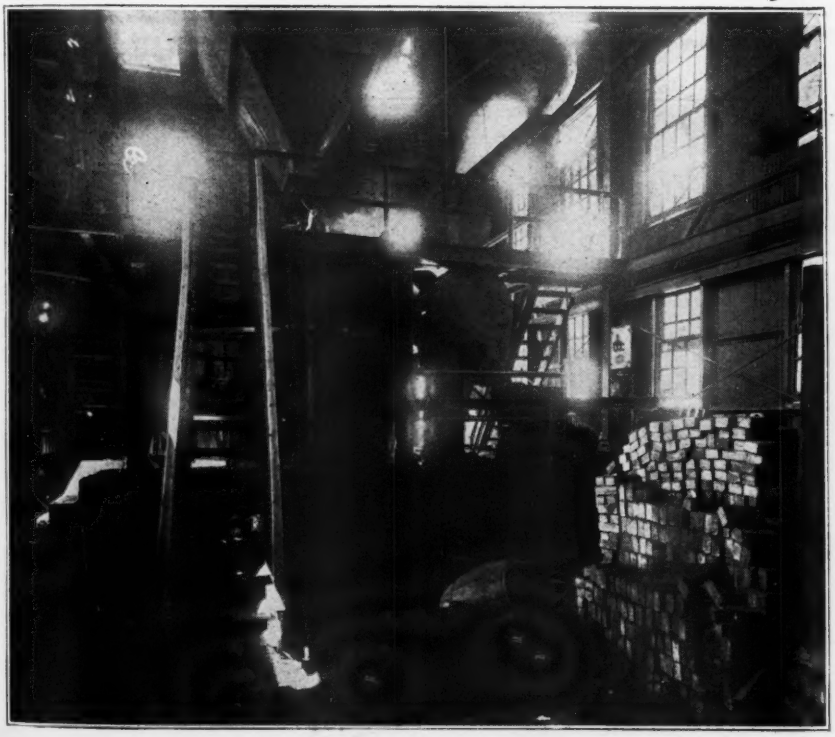


Fig. 8—The Gas Producer Showing Tank at Top.

Fig. 1—Marble Stone Yard Showing Travelling Crane.

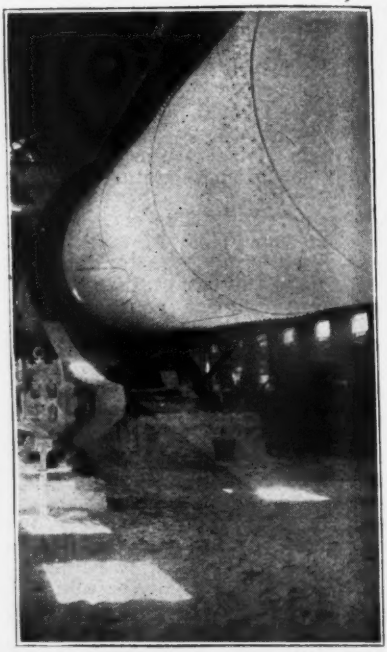


Fig. 4—Details of Gears and Motors with Belt for Driving the Kiln—The Gears Run Through a Bath of Oil on Account of Heat and Dust.

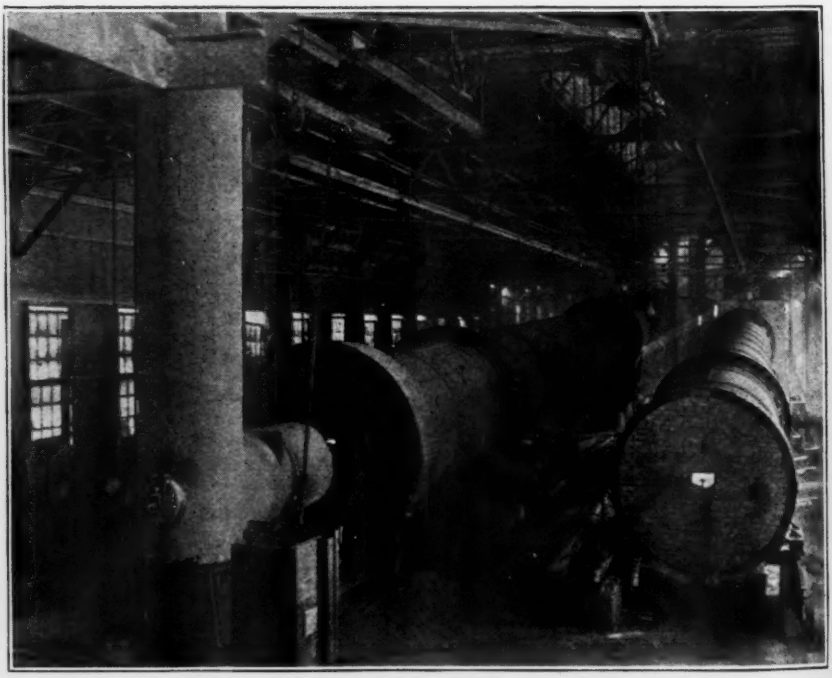


Fig. 3—View Showing Full Length of Kilns. The Pulverized Rock is Fed at Distant End—the Stack for the Burned Gases is Shown in Foreground.

railroad cars to storage bins or the one from the carrier from the storage bins to the crusher. This is to insure continuity of operation in case anything should go wrong with either of the regular motors. Figure 8 shows a view of the producer.

The power consumption of this plant is 40,000 K.W.H. per month to turn out 1,800 tons of lime in the same period. This, of course, is on the basis of full capacity production with continuous operation. Three kilowatt-hour meters are used to measure the power consumption of the different operations. One of these is on the lighting circuit, one for the "burning" machinery, and one for the hydrating machines. The sum of these, subtracted from the readings of a fourth meter which registers the total power consumption of the whole plant, gives the power used by the crushing operations.

It is interesting to note that gravity is used to such an extent that all of this saving of labor as well as all other operations is accomplished by means of thirty motors as listed in the following table. They are all

Operation	No. of Motors	H. P.
Jaw crusher	1	150
Gyratory crusher	1	50
Roller crusher	1	35
Hammer mill	1	50
Kiln	1	30
Cooling tube	1	10
Screw conveyor	1	10
Bucket conveyors from gyratory crusher to rolls	1	7.5
Bucket conveyors from rolls to roof to feed three-way spout	1	7.5
Bucket conveyors from hammer mill to kiln storage	1	10
Bucket conveyors from cooling tube to storage, hydrating, etc	1	10
Separators	2	5
Hydrating	2	20
Bagging	1	15
Pump in cooling pit	1	2
Air compressor	1	15
Carrying coal	1	10
Belt carriers for coal from cars to storage	2	5
Coal carrier from storage to crusher	1	2
Coal crusher	1	10
Turning gas producer	1	5
Coal elevator from crusher to top of producer	1	7.5
J or belt carrier to producer tank or storage bin	1	7.5
Pump in pump house	1	2
Pump in pump house	1	12
Crane Motors { Trolley	1	5
Crane Motors { Hoist	1	25
Crane Motors { Bridge	1	25

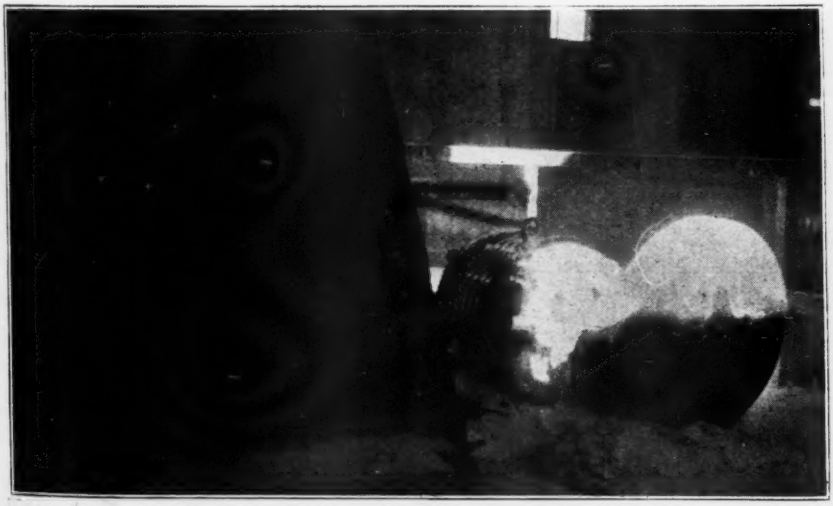


Fig. 9—Showing How the Dust Collects on Motors—This Motor Drives One of the Bucket Elevators.

220 volts A. C. induction motors, three phase, except the crane motors which are 220 volts D. C.

This total of 30 motors is under the care of one man whose duty it is to maintain them in operation unless the repairs require their being sent to the shop, but during the last eight years this has not been called for. All of the motors in the large building where the lime is made, are very badly exposed to dust as is indicated by the condition of the ones shown in Figures 4 and 9. As a result of this, it is necessary to blow out all of the motors once a month with compressed air. This accounts, in part, for the air compressor shown in Figure 5. Its other functions are to supply air for the pneumatic drills used to break up pieces of marble which are too large for the big crusher, and in the hydrating process. Contrary to what we might expect, this kind of dust does not cause any particular trouble with belts.

The electrical wiring is in conduit and above ground on roof trusses, columns or walls to as great an extent as practicable so as to avoid moisture. Rubber insulated and braided conductors are used in all cases except near the kiln, especially above it, where "slow burning" wire, supported on porcelain insulators or knobs, has been used instead, because it is impossible to maintain rubber insulation for any length of time on account of the heat.

New Incorporations

Prairie Sand and Gravel Company, Prairie du Chien, Wisconsin, capital, $25,000—500 shares, par $50, by C. J. Knight, Elizabeth Knight and L. D. Smith.

Fitze Marble and Tile Company, 3939 Magnolia Avenue, capital $90,000, to manufacture marble, tile, granite, concrete and to deal in product goods. A. C. Fitze, E. K. Fitze and T. O. Williams.

Duntile Manufacturing and Supply Company, Camden, Massachusetts, to manufacture cement products; 1,000 shares, no par. Earl R. Zimmerman, Camden; Frederick H. Straub, Everett E. Zimmerman, Philadelphia.

Andrea Realty Corporation, 277 Broadway, New York; Capital, $10,000. J. E. Peck, E. Isner, L. L. O'Gray.

H. V. Concrete Products Corporation, Albany, New York, asbestos and cement shingles; 1,000 shares, $100 each; 1,000 common, no par; H. A. Dwight, E. T. Moon, F. R. Scherer.

Trudeau Sand and Gravel Company, Toledo, Ohio. Capital $10,000. Samuel and Goldie Trudeau.

National Quarries Company, Carey, Ohio, has purchased the Brokensword Stone Company at Spore, five miles north, for about $20,000. Extensive improvements will be made at the quarries which furnish road grading stone and limestone flux for furnaces.

Green Concrete Corporation, Brooklyn, capital $2,500; to do a building business. Directors: Frank and Elizabeth Breen, 386 Manhattan Avenue, and Peter Brody, 180 Jackson Street, Brooklyn.

The Southern Mineral Company has resumed operation of the limestone quarry five miles west of Winnfield, Louisiana. This is the only limestone quarry in the state of Louisiana.

The Leopard Stone Quarry on the Peter Hairstone plantation near the Yadkin River, Davie County, will be opened and operated by the American Stone Corporation of Salisbury. The necessary machinery has been purchased. This quarry is said to contain the only stone deposit of its kind in the world, so far as known. It is a white quartz, mottled with balls of green horn blend, the finest stone for decorative purposes known.

The Pleasant Valley Lime Company, of Thornton, near Little Rock, Arkansas. A modern crusher has been ordered.

Mactile Machinery Company, Incorporated, Queens, near New York City, to manufacture cement products. Capital, 250 shares preferred, $100 each, 600 shares common, no par value. Directors: James S. Linehan, Queens; Thomas Gerns, Jamaica; John J. Murphy, Springfield, L. I.

Walter O. Lloyd and Company, Incorporated, Poughkeepsie, New York, to operate the former business of Walter O. Lloyd, contractor, and the Poughkeepsie Sand and Gravel Company, Incorporated. Capital, $50,000. Incorporators: Walter O. Lloyd and William B. Hamill of Poughkeepsie, and Harold W. Drake of New Haven, Connecticut, each holding equal shares.

The Peoria Stone and Marble Works, Peoria, Illinois, will rebuild the factory destroyed by fire last summer.

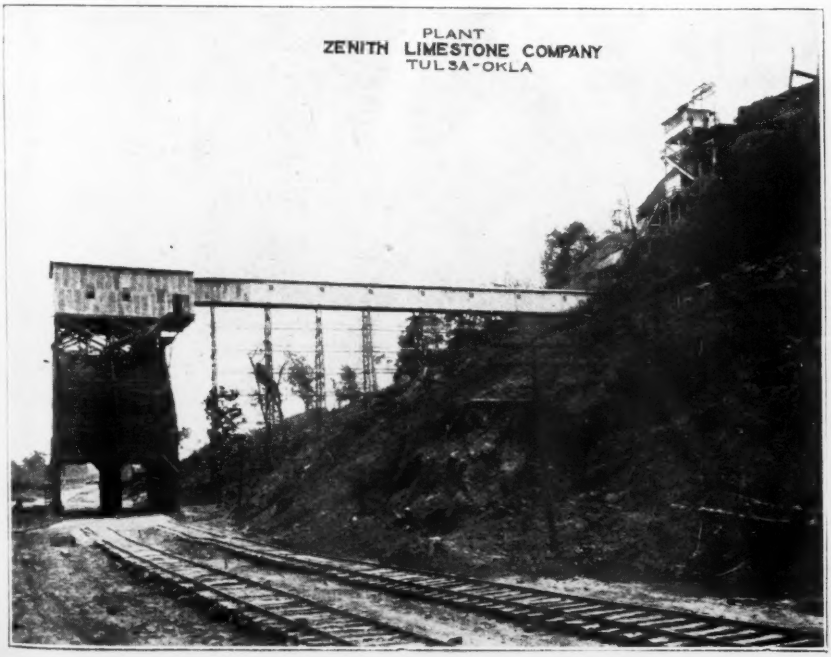
Utilizing Gravity In Crushing Stone In Largest Middle West Plant

Gravity Used Throughout with One Conveyor Belt Exception Most Modern Plant Produces at Low Cost with Little Labor

SIDE HILL operations in the crushed stone industry present an interesting study. Those that keep a careful check on their costs state that there are many advantages to this method. The nature of the deposit has everything to do with the method of operation and type of plant. There have been many producers, however, who have passed up deposits because it would have been necessary to operate a side-hill plant. The reasons vary in each case. Fear and lack of engineering skill have had much to do with this reluctance in the majority of cases. It undoubtedly does take skill to operate a large side-hill crushed stone plant. There is also a greater element of risk in the success to be attained.

The Zenith Limestone Company had an excellent stone, a great possible market, capital and engineering skill, so the side hill method of operation offered but few obstacles and many advantages. The company has succeeded in building one of the largest and most modern crushed stone plants in the middle west. The plant is strictly a side hill proposition. Gravity is utilized throughout with the exception of one conveyor belt from the primary bins to the screens. This is a distance of 200 feet. The quarry is at Price, Oklahoma, west of Tulsa and about four miles from the County Court House.

The lower strata of this quarry consists of approximately 110 feet of shale, another layer 30 feet of sandstone, above which is 34 feet of shale, on top of which there is about 50 feet of high calcium limestone. There is also a very thin seam of coal between the limestone and shale. This is a slight disadvantage as this coal must be separated from the clean stone. There is a good deposit of coal at another point of the quarry which will be utilized to furnish a good



An Excellent View Showing the Entire Zenith Plant.

grade of coal for fuel. Two oil wells have been sunk at another part of the deposit, and a good grade of oil is being pumped. Although there are oil and coal present, the plant is operated throughout by electricity with the exception of the steam shovel and locomotive. The supply of stone is practically inexhaustible. The very small amount of overburden which exists is easily separated by herring-bone screens. The principal quarry work at the present time is straightening out the quarry face which is approximately 40 feet high and 600 feet long.

Drilling in the quarry is handled by Armstrong well drills. The stone is picked up by a Marion steam shovel equipped with a 3½-yard bucket and loaded into quarry cars. These quarry cars were designed by Mr. Long, one of the partners in this enterprise and also the principal designer of the plant. These cars are standard gauge flat cars with one side left on and the other side and two ends open. There will be 20 of these cars in operation very soon. A ¾-yard shovel is used to keep the face clear ahead of the big shovel. As soon as the face is cleared, another shovel will be added to maintain a capacity of at least 2,000 tons daily.

These quarry cars which have a capacity of 50 tons are hauled by a standard Baldwin locomotive and are unloaded by a plow which is suspended on cables so that the bottom of the plow is on a level with the floor of the quarry car. As the car is pushed forward the plow scrapes the material off into the initial crusher. This plow in itself acts as a feeder and at no time is there any reason for the crusher to be overloaded or buried as is sometimes the case in many plants.

This primary crusher which is a No. 30 Kennedy gearless crusher discharges over a stationary bar grizzly with 2-inch openings. The oversize material passes to a No. 49 Kennedy crusher which in turn discharges into another bar grizzly. The oversize from this grizzly passes to a No. 37 Kennedy finishing crusher. The discharge from this No. 37 crusher meets with the material that passes the two grizzlies and is dropped through a chute into what is called the primary bin with a capacity of 200 tons. From this bin the stone drops by gravity to the only conveyor belt in the entire plant. This conveyor belt, which is under the bin, is arranged to operate horizontally through an enclosed gallery. The belt conveyor which is 30 inches wide delivers the stone a distance of 200 feet to the screens. There are two Kennedy 24x5 feet screens which drop the stone to stor-

View Showing the Arrangement of the Crushers and the Only Belt Conveyor in the Plant.

age. The storage capacity is approximately 3,500 tons.

The plant is equipped throughout with Kennedy gearless crushers and Kennedy screens. There are two tracks under the bins making it easy to load four cars at once. There are 800 feet of storage track for empty and similar amount for loaded cars.

The storage bins are made of 3-inch boards. Between each board there is a 3-inch air space. This type of bin retains the material and saves considerable in lumber. The bottoms of the bins are constructed of 3-inch boards on end. Material is discharged from the bins through clamshell bin gates. The fine material is stored in bin sections directly below the screen house. The coarser sizes of stone are exposed to rain as there is no roofing over the storage bins. This is interesting but practical as there is no need for keeping the coarser sizes of stone absolutely dry.

At the discharge end of the belt conveyor there is a stone box or hopper from which material is fed to the screens. This hopper has sloping sides to which iron bars are fastened at right angles. These bars are so arranged as to permit a quantity of stone to lodge between them and thus form a protective surface for the sides of the hopper. This method reduces the wear to a considerable extent. Another interesting innovation has been adopted with the chute that delivers to the belt conveyor at the receiving end of the conveyor. This chute discharges in the same direction as the belt runs, and a number of holes have been punched toward the end of this chute. The fine material drops through these holes onto the belt and acts as a blanket for the heavier material which is discharged from the end of the chute. This arrangement undoubtedly reduces the surface wear on the belt.

The chutes referred to in this article are made of 10-inch pipe. As any particular section becomes worn, the pipe can be turned and a new surface exposed to the shock of falling stone. These closed chutes have proved to be very practical in the operation of this plant.

At present the plant is producing 2,000 tons of stone per day in sizes of 2, 2½, 1, ½, and 1¼ inches and dust. The plant is so arranged, however, that this production can easily be doubled if necessary. Stairways at the plant are all on the outside and were constructed to take advantage of the space between the boards that made up the side walls. The boards for the stairs were cut a little longer than needed and were then fitted into the open spaces and nailed. The company is installing every known safety device for the protection of its employees.

Mr. H. H. Bell is president of the Zenith Limestone Company; Mr. R. D. Long is vice president and also the designer of the plant; Mr. T. L. Gibson is secretary and treasurer of the corporation.

U. S. Tax Receipts Exceed Estimates

Earlier predictions that income and miscellaneous tax receipts during the fiscal year 1924-25, a part of which were returned under the new tax rates, are meeting and in some instances even exceeding estimates were substantiated today when the Internal Revenue Bureau made public statistics for the first eight months of the fiscal year and comparative figures for the same period of the previous year.

When these figures are taken in connection with the treasury estimates of the taxes returned during the present month, and taxes which it is estimated will be received in April, May and June, the concluding months of the fiscal year 1924-25, it is apparent that the total for the present fiscal year will at least slightly exceed estimates and give a budget surplus on June 30 of well in excess of $100,000,000.

The statistics made public show that the collection of income taxes for the eight months from July 1, 1924, to March 1, 1925, totaled $861,123,104. The treasury has estimated that in the present month, which includes the first installment of income taxes, there will be raised an additional $430,000,000.

The new statistics add to the assurance that another reduction of $300,000,000 or $350,000,000 in taxes to be paid in 1926 on business done in 1925 may safely be made by Congress. Administration experts have figured that it would be safe to predict a reduction of $300,000,000, leaving a prospective surplus of $74,000,000 to make certain a balanced budget for 1925-26 even if all expectations of taxes returned were not realized.

They chose the easy way

When the Sterrett Sand and Gravel Company needed a crusher, a screen, and a sand pump they took the easy way to get the information on this equipment—they looked in the HAND BOOK. In a recent letter they said:

> "We certainly do use the HAND BOOK when contemplating buying machinery and have purchased equipment from the following firms, that were brought to our attention by the HAND BOOK:"

You, too, can make the job of answering questions on equipment, operating data, etc., easy by referring to the HAND BOOK. It contains a wealth of material, well indexed for ready reference.

Pit and Quarry

HAND BOOK

RAND-McNALLY BLDG., CHICAGO

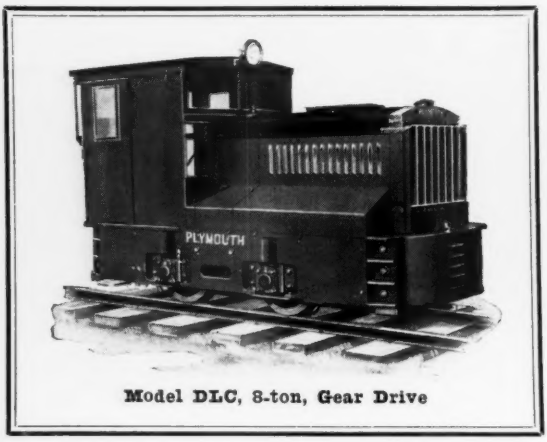
Ten Plymouths Used by Be

TEN PLYMOUTH Gasoline Locomotives are moving in this Quarry like shuttles in a loom. Each locomotive delivers its load from shovel to base of incline every 60 seconds, and over a distance of 600 track feet.

Frequently these Locomotives go on duty at 6 o'clock Sunday evening and run day and night until 6 o'clock Saturday evening without stopping the engine. Four of the locomotives have been in use 6½ years, four 4½ years, and two 2 years. An exceptional performance and a test of efficiency.

Verily, the PLYMOUTH is first in the field, first in performance, and first in the affections of the user.

THE FATE-ROOT-HEATH COMPANY
Plymouth Locomotive Works
PLYMOUTH, OHIO

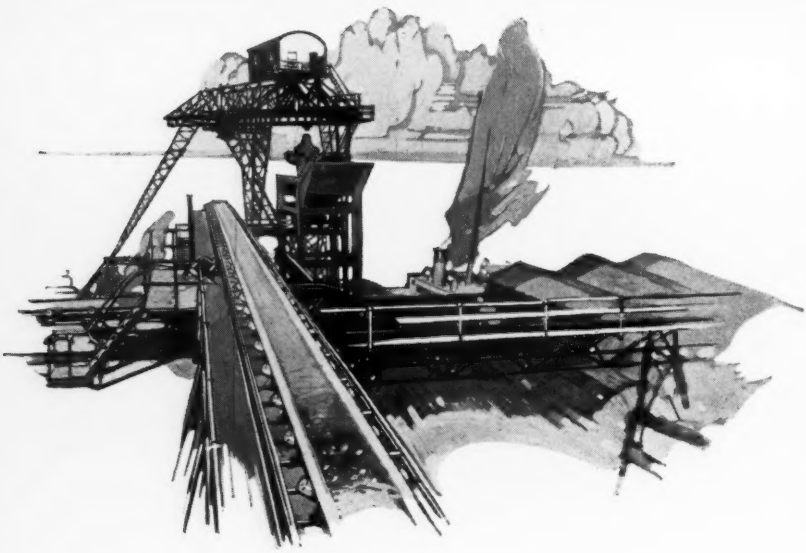


Model DLC, 8-ton, Gear Drive

Gasoline PLYM

by Bethlehem Mines Corp'n

MOUTH Locomotives



Here's a Way to Reduce Sand Handling Costs

On any job where sand and gravel is handled, a Brownhoist Belt Conveyor will cut handling costs and make possible an economy that is surprising through its remarkably low upkeep and maintenance costs.

For instance—excessive wear in a belt conveyor is invariably the result of friction and the point of greatest friction is the idler.

Brownhoist roller bearing idlers are fitted with Timken Roller Bearings and packed in grease which needs renewal but once a year. They are practically grit-proof, dirt-proof and friction-proof. Consequently these idlers, like all parts of a Brownhoist Conveyor, give long, economical trouble-free service.

Brownhoist engineers have helped reduce handling costs in many hundreds of plants. Their advice on any handling problem is yours for the asking—without obligation. Write for a copy of Catalog M on belt conveyors.

The Brown Hoisting Machinery Co., *Cleveland, Ohio*

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BROWNHOIST

MATERIAL HANDLING MACHINERY

Producing 250 Cubic Yards Daily With Portable Scraper

Munger Rock Company Operating Plant in Phoenix, Arizona Five-Truck Fleet Delivers All the Material to Local Market

PHOENIX is the capital of Arizona and the county seat of Maricopa County. This county is larger than the state of Massachusetts. Phoenix has an estimated population of 40,000 and it is the largest city and most important commercial and industrial center between El Paso and Los Angeles. It has direct connection with the Santa Fe and Southern Pacific Railroad, and is also served by eight overland highways, one of these the Apache Trail, which has over 300 miles of newly finished concrete paving. This capital city of Arizona lies in the very heart of the famous Salt River Valley of 300,000 irrigated acres. This county ranks twelfth among the fifty leading counties of the country in value of crops. The great Roosevelt Dam supplies 240,000 acres of this land with water. There are more than 350 miles of excellent paved roads in this Salt River Valley. Arizona has had the greatest percentage of increase in population of all the states in the Union during the last decade. The Southern Pacific Railroad is now making surveys for building a new line of the railroad which will permit routing of through continental and passenger trains by way of Phoenix. These facts all have an important bearing on the operations of the C. P. Munger Rock Company who operate a plant about two miles from the center of Phoenix.

Construction of the plant was started the first of August, 1924, and material was being delivered on September 22. The company has leased 40 acres in an old river bed channel. The material runs from 20 to 30 feet deep and about 50 per cent sand and 50 per cent gravel. The bank gravel

The C. P. Munger Rock Company's Plant.

View Showing a Good Section of the Deposit.

runs from 8 inch boulders down to fines.

At first a Sauerman ½-yard Crescent scraper operated by a Sauerman portable electric hoist driven by a 15 H. P. motor brought the material in a distance of 200 feet to a hopper above a Telsmith feeder. The feeder discharges onto a grizzly with 2½-inch openings. The oversize went to a Blake type jaw crusher and the undersize went directly to an elevator. A little later the dragline was extended to 400 feet.

At the present time an inclined roadbed has been built and 26 gauge industrial track installed. This inclined roadbed is 450 feet long. The ½-yard Sauerman scraper is now operating 400 feet out from the end of this roadbed. These conditions are rather severe for such a light plant, but the results seem to justify this arrangement. It is really an unusual-

This View Showing Character of Top of Deposit.

ly long span for such a light scraper outfit. The scraper brings the material into a bunker at the end of the roadbed. The bunkers are built of lumber over a ramp and they have bottom discharge. There are four bunkers holding 125 cubic yards each. There is a cement floor under these bunkers. From the bunker the material is hauled into the plant by a 1-yard skip and a belted hoist driven by a 15 H. P. motor. A superstructure is built up over the feeder. The skip is hauled up a tipple and automatically dumped.

All material is washed. The water is brought from a well about 60 feet from the plant. This water is pumped by a 4-inch centrifugal pump driven by a 5 H. P. Fairbanks Morse motor through a four-inch pipe directly to the top of the washing and screening plant. The screens are also equipped with sprays for additional washing. The silt and dirty water are flumed away from the plant to a former pit some 100 feet away. A Telsmith sand settling tank is used in separating the sand.

The oversize from the grizzly is crushed in a Blake Type jaw crusher. After crushing, the material is elevated by a 20-inch rubber belt conveyor 40 feet centers and equipped with 9x18 inch buckets to the Telsmith screens. These screens are 15 feet by 30 inches of the trunion roller type. One of these screens produces the ⅜-inch sand, another the 1¼-inch and 1½-inch material and another the 2½-inch material.

The company office is located at the delivery end of the ramp so that incoming and outgoing trucks can be checked going in and out of the plant. Trucks are used entirely in delivery of material and are kept at the plant for immediate service. This delivery service is an important factor in keeping customers satisfied as all service is then under control. A fleet of five trucks is ample to handle present delivery demands. The plant has run 100 per cent since the day it started with production averaging 250 cubic yards daily.

Mr. Herman Douglass and Mr. E. I. Chapman are associated with Mr. C. P. Munger in the management of the C. P. Munger Rock Company.

Link-Belt Co., Chicago, Ill., has issued Book 546, which contains 48 illustrated pages describing the Link-Belt Skip Hoist for all capacities from the smallest to the largest.

Quarter's Loadings Set New High Mark

Revenue freight loadings during the first three months of this year reached a new high record for the season, the total of 11,765,235 cars shown in a compilation of carrier reports by the American Railway Association exceeding by 177,224 cars, or 1.5 per cent last year's previous high mark for the same months. The period covered in the reports was from January 1 to March 28.

For the last week of that period the total of 931,395 cars loaded was an increase of 22,032 cars over the preceding week of 24,006 cars over the corresponding week of last year. All commodities shared in the increase over the week before, with the exception of live stock.

A comparison by weeks follow:

	1925	1924	1923
April 4	931,395	907,389	896,735
March 28	909,363	908,390	936,274
March 21	909,363	908,290	916,818
March 14	924,149	916,762	904,116
March 7	930,009	929,381	905,344
February 28	862,910	944,514	916,624
February 21	925,295	945,679	830,187
February 14	902,877	935,589	816,646
February 7	928,244	906,017	849,352
January 31	896,055	929,623	865,314
January 24	924,254	894,481	869,464
January 17	932,150	894,851	864,297
January 10	932,807	872,023	873,908
January 3	765,727	706,292	727,246

Worthington Pump & Machinery Corp., 115 Broadway, New York City, has issued its bulletin No. W-607, entitled "Worthington Centrifugal Pumps Serving Every Industry."

Swaby Dredging Bulletin

Bulletin Number 4 A, Swaby Sand, Gravel, Dredging Pumps, has just been issued by the Swaby Manufacturing Company of Chicago. "The production of sand and gravel by means of a centrifugal pump is the most economical method and is the method most frequently used where the water supply is ample," says the book. The various types of pumps are described and illustrated.

The pumps are of the solid casing type and all the working parts are of semi-steel. "This type," says the bulletin. "is not only reasonably low in price, but also the ease and low cost at which repairs can be made are important features to consider."

The chief advantage in pumping sand and gravel is that the material may be excavated and delivered directly to its destination without rehandling.

Another Step Forward

THE quarry owners and operators in the St. Louis, Missouri, district, not to be outdone by their sister states, have recently perfected a temporary organization, which they have termed "The St. Louis Quarrymen's Association."

Meetings are being held about every two weeks at noon time when the members meet together at luncheon and have round table discussions of ways and means of making this temporary association a permanent one for closer co-operation between the quarrymen in that territory and for the promotion of the use of the products of their quarries.

The fourth meeting was held at the American Hotel in St. Louis at 12:30 P. M. on Wednesday, April 1st. Temporary officers are as follows:

J. G. McKelvey, temporary president; Louis Skrainka, temporary vice president; J. W. McCullough, temporary secretary and treasurer.

Temporary headquarters of the association are located at 1026 Title Guarantee Building, St. Louis.

The idea of calling a meeting and forming an association was Mr. McKelvey's, temporary president, and he is surely to be congratulated for taking the initiative and moreover congratulated, as he has already 90 per cent of the quarrymen in the territory enrolled as members. The membership to date comprises the following companies:

Clayton Quarry Co., Title Guarantee Bldg., St. Louis, Missouri; Eyermann Construction Co., 1216 S. Grand Ave., St. Louis, Missouri; Fehlig Construction Co., Thersa and Hickory Sts., St. Louis, Missouri; Hoffman Bros. Construction Co., 2712 Wyandott St., St. Louis, Missouri; M. S. McCarty, Summit Ave. and Missouri Pacific Tracks, Webster Grove, Missouri; Rock Hill Quarry and Construction Co., 1026 Title Guarantee Bldg., St. Louis, Missouri; J. S. Steffan & Bros., 4760 Siebert Ave., St. Louis, Missouri; Union Quarry & Construction Co., 4687 Natural Bridge Road, St. Louis, Missouri; West St. Louis Quarries Co., 205 Scouteau Trust Bldg., St. Louis, Missouri; Tower Grove Quarry & Construction Co., 5927 Fyler Ave., St. Louis, Missouri; Bambrick Construction Co., 2529, St. Louis Ave., St. Louis, Missouri.

This association is rather unique in that its members in a great many instances are engaged in the contracting business as well as quarrying. Practically all of the quarry companies represented have quarry operations within close proximity of St. Louis proper and are not alone producers of crushed stone, but producers of building stone, and rip rap for which there is a big demand in St. Louis and its suburbs. Owing to the varied products sold the problems confronting such an association are somewhat different from those encountered by associations whose membership consists strictly of companies producing crushed stone. One of the big problems confronting this association is to encourage its members to sell rip rap and building stone on a weight basis instead of on a volume basis, which has been the practice, and to educate the stone masons in buying stone and figuring work on such a basis. Another problem of this association is to encourage and promote the use of crushed stone in highway pavement and building construction and its use as a coarse aggregate in all forms of concrete, as gravel in this district is plentiful and appears to be very cheap.

Even with such problems, which are somewhat unique, the association will doubtless become a permanent institution owing to the spirit and interest displayed and the good to be derived from such an association will unquestionably be reflected in better business conditions for every member. In an association of this sort organized for the mutual benefit of all members, mere duty on the part of each and every member is not what profits, but it is that which is volunteered over and above actual duty, that service which we are willing and ready to give that makes for success or failure.

We welcome you, St. Louis Quarrymen's Association.

Northern Conveyor Company to Move

The Northern Conveyor and Manufacturing Company, Auer Avenue, Milwaukee, builders of portable conveyors, will move to Janesville, Wisconsin, on or about June 1st. A large modern factory building, fully equipped, of about 32,000 square feet has recently been erected. The new plant will provide facilities for easily tripling their present production of two conveyors per day.

Fundamentals of Fuel Economy

Written Expressly for PIT AND QUARRY by CHARLES LONGENECKER

THE words "Fuel Economy" remind one very much of the old musket that lies suspended on two nails on the farm house wall. Once in a while when a hawk is making depredations on the young chickens the old gun is taken down, dusted off and put into action. When the hawk has been disposed of, it is again put back on the nails to become rusty and dusty until some emergency again necessitates its use. Likewise with fuel economy. When fuel losses climb high and the plant manager's attention is called to the fact, fuel economy is brought into action. For some time no effort is spared to reduce waste and with perseverance very considerable savings are made. This condition exists for some appreciable time then like the old musket, fuel economy is laid away. The CO_2 recorder runs out of ink, the draft gauge clogs with rust and the pyrometer wires are broken. True like the old musket this is more a picture of the past than of the present but the simile can be applied even today in many plants. Fuel economy is being considered more seriously today than ever before. It has not been called forth but has thrust itself into the foreground and cannot be dismissed by a wave of the hand. If dismissed, without consideration, it is accompanied by a loss which is reflected in higher cost of production. Wide awake plants are putting engineers, versed in methods of instituting economies in fuels, in charge of operations which involve the burning of fuels.

The first step in determining means whereby fuel may be saved is to make a survey of existing conditions. Each piece of heating equipment should be tested and its limitations determined. When the fuel consumptions have been obtained comparisons can be made. Comparative studies afford the best means of procedure. Thus when a cement kiln in plant A has a much lower fuel consumption than a similar kiln in plant B, both operating under the same conditions, there must be a reason. There is then an incentive for plant B to exceed the record of plant A.

Recently the writer was asked to make a survey of the heating operations in a plant with the intention of advising what steps could be taken to reduce the fuel losses on the several furnaces. Naturally inquiry was made as to what amounts of fuel the furnaces burned per unit of output. This information could be given only in a vague manner so there was no starting point. Until this is known no progress can be made.

In another plant an organization had been built up which, to the best of the writer's knowledge, obtains the very highest results in furnace efficiency. This department has complete charge of all fuels. All coal and oil are analyzed and the results secured in burned units is then recorded. By experimenting with fuels of varying characteristics those that give the poorest results are eliminated. When the most satisfactory coal or oil has been selected the next problem is to provide equipment which will utilize it most efficiently. The men in this department devote their time exclusively to problems pertaining to combustion. Each furnace is tested in turn and when one shows a falling off in efficiency, it is repaired and the trouble corrected. In this manner a set standard is maintained with the result that this particular plant has an average fuel consumption below that of any of its competitors. Organizations patterned after such as this, possibly on a smaller scale, will be the rule rather than the exception henceforth. No large consumer of fuel can afford to trust to haphazard methods. At present the cost of coal is comparatively low but it is sure to climb up in the course of time.

One of the most important elements in maintaining low fuel costs is the personal element. There is very little incentive for men handling furnaces to conserve. Where an incentive is provided and adequate supervision accompanies the incentive, economy will be forthcoming. This factor has been most apparent to the writer who has spent the past 20 years in actually operating and supervising the operation of furnaces. Frequently in buying coal the purchase is made at the lowest price which can be secured and then much of the benefit of the low price is lost due to negligence on the part of the attendants when the coal is burned. Recording instruments are

of great advantage in keeping a record of furnace conditions and their use is becoming more extensive.

Engineers now appreciate the absolute necessity of holding furnace conditions uniform or of keeping them under strict control. This has brought to the front the question of automatic control of both the fuel and air supply and the control of the draft. These features have not been accorded the position they deserve. This has been due to some extent to the unreliability of the instruments offered but as control devices have been perfected, their installation will increase. Draft control is especially requisite as it is easy to understand the loss which can be suffered through instable air supply.

Another factor which merits consideration is the choice of the proper fuel not only as regards the design of furnace but also in relation to cost. To illustrate this point a case can be cited which came under the observation of the writer. A plant located near the coal fields of Western Pennsylvania had been burning oil at a cost of 6½ cents per gallon in three large furnaces. When these furnaces were built oil could be purchased at a low figure and its use was attractive. To burn coal would have necessitated the installation of costly machinery which fact together with labor involved counterbalanced the saving to be effected by the purchase of coal even at a low price. By replacing the oil with powdered coal, a saving amounting to approximately $40,000 will be realized. This saving is made possible by the perfection of machinery for pulverizing and delivering coal at a price low enough to give the return mentioned. The machine is of the "Unit Type."

A fundamental which is often lost sight of is the uniform feeding of the fuel. This may best be illustrated by an example. At a certain plant the amount of fuel oil per unit of output was found to be high. To reduce the quantity a large number of tests were run using burners of different makes as it was thought the weakness was in the type of burner. The expected reduction was not forthcoming to the degree expected. It was then discovered that the oil pressure from the pump fluctuated within quite wide limits which naturally gave a very uneven supply. To remedy this trouble the oil was pumped to a tank at such a height that the pressure in falling to the burner was that desired. The oil in this manner was delivered at a constant pressure and an immediate improvement resulted. Where any fuel is not fed uniformly, it is apparent that the air supply cannot be regulated to conform to the fluctuations so that at one time there may be a deficiency of air and at another a surplus and at no time will the quantities of fuel and air be in the correct ratio. The feed of powdered coal in cement kilns is very frequently uneven. Where powdered coal and the air to burn it are closely controlled, and maintained in correct ratio, the highest efficiency is obtained. In fact, it is the ability to closely regulate powdered coal that gives it its high standing. On the other hand burning coal by hand firing is least satisfactory due to the intermittent feed. Hand-firing approaches its highest efficiency when the coal is fed frequently and in small quantities. There is less trouble from a fluctuating air supply as usually air is delivered by a fan or blower which runs at a constant speed and hence there is not much chance for variations. Where the current to the motor driving the fan fluctuates, trouble may be found.

Next to the uniform supply of fuel and air there must be a complete intermixture of the two. This intermixture is very hard to secure. All burning equipment aims for this one principal feature. Oil burners, powdered coal burners, gas burners and stokers are constructed with this as a cardinal feature. It must be borne in mind too that the mixing must be at its maximum just where the fuel is ignited and burns. When any fuel is burned it must first be gasified, then the hydrocarbons must be broken up. The carbon and hydrogen then unite with oxygen and are consumed. These progressive steps are really instantaneous but the time element is vital and cannot be too short. This brings in the element of velocity, as velocity is a function of time.

There is a tendency among some to belittle the theoretical side of combustion. In many plants very good results are being obtained by uneducated men who are altogether ignorant of the theory underlying combustion and this is cited in defense of the practice. On the other hand though, if these same men had a thorough understanding of the theory they would get results far beyond

those derived from experience alone. They would also eliminate the element of chance. In one instance which can be cited a man who had made a very enviable work as a furnaceman in one plant in Ohio was sought by various companies to handle their kilns. This man's record had attracted the attention of several competing companies as he was able to get a high quality of product at low cost. The man finally accepted the offer of another employer and was given complete charge of the work in the new plant. Here he found conditions altogether different from those in his former place of employment. He was unable to adapt his ideas and practices to these new conditions with the result that he could not achieve the success expected. There is also the danger of too much theory and not enough practical experience. The happy solution is a combination of the two backed up by good judgment in the proper use of both theory and practice. There are so many variables which must be recognized and evaluated that experience is absolutely necessary. It is the application of the theoretical principles that requires years of experience.

Unfortunately attempts to economize on fuel generally give prominence to heat generation rather than on the application of the heat after it has been generated. It is useless to bring the burning of fuel to perfection unless the heat resulting is utilized to the same degree.

Specifications for Architects and Engineers

A six page specification sheet for use by architects and engineers has just been published by the CoKal Stoker Corporation. This has been specially prepared to give complete information to architects, consulting engineers and others concerned with specifying and installing semi-mechanical stokers under boilers. The most desirable settings for smokelessness and high combustion efficiency are given for nine different types of boilers. There is also a table giving the various dimensions of the furnace and boiler settings for the various boiler arrangements. A table of chimney capacities gives both diameter and height for capacities ranging from 23 to 6,155 b.h.p., for diameters ranging from 18 to 144 inches, and for heights from 50 to 300 feet. This bulletin has been gotten up for quick reference.

271 Railroad Bills Offered

A total of 271 bills and resolutions affecting the railroads were introduced in the Sixty-eighth Congress, which adjourned last month. Of this total, five were enacted into law, three in the first session and two in the second. The bills that passed were: An act to extend from two or three years the time in which a shipper may begin action for the recovery of overcharges; an act affecting the inspection of locomotive boilers; an act creating an inland waterways commission; the Hoch-Smith resolution for a revision of the rate structure; and a measure designed to aid in the prosecution of persons breaking the seals on railroad cars. Among the important measures that failed of passage were: The Howell-Barkley bill, calling for the abolition of the railroad labor board; the bill for the repeal of the Pullman surcharge; the Gooding bill, calling for the strict enforcement of the "long and short haul" clause of the Interstate Commerce Act; and the port differential bill, designed to eliminate differentials in rates on export shipments as between the several ports.

National Slag Elects

The Eighth Annual Meeting of the National Slag Association, 933 Leader-News Building, Cleveland, Ohio, was held Friday, April 3rd, at the Hollenden Hotel, Cleveland, Ohio.

During the business sessions the following officers were elected for the coming year: President, C. L. McKenzie, Duquesne Slag Products Company, Pittsburgh, Pennsylvania; Vice-President, C. E. Ireland, Birmingham Slag Company, Birmingham, Alabama; Secretary-Treasurer, H. J. Love, 933 Leader-News Building, Cleveland, Ohio.

Republic Appoints New Distributors

Official announcement is made by the Republic Motor Truck Co., Inc., Alma, Michigan, of the appointment of David J. Jones, 13-19 Coal Street, Shamokin, Pennsylvania, and Service Motor Sales Co., Mandan, North Dakota, as distributors for Republic trucks in their respective cities and surrounding territory. Up-to-date salesrooms and well equipped service stations are maintained by both distributors, together with a complete stock of genuine Republic parts for all models.

Economies Resulting From the Use of Listed Standard Gears

By WARREN G. JONES, President, Jones Foundry and Machine Company

TWO of the most important items in the cost of small quantities of bevel gears are pattern charge and drafting-room expense or the cost of entering the shop order with the necessary information to properly execute the order. Each pair of gears requires a sketch or drawing showing outside diameters, face angles, edge angles, back angles, cutting angles, hub length and backing of each gear and pinion. Patterns also must usually be made unless standard listed gears are used.

Even if a manufacturer has several thousand well assorted bevel gear blank patterns, it would be safe to say that in not more than one instance out of ten could existing equipment be used without alteration. This may be better understood when we analyze the pattern situation more closely. Bevel gears mesh correctly in pairs only. Consider for example a 16 tooth pinion mating with a 48 tooth gear with ratio of 3 to 1. If the number of teeth in the pinion be increased or decreased it will change the angles of the mating gear.

As a matter of actual practise, if a pattern be made for the above pair of gears, it would probably be usable for the same number of teeth (48) of the same pitch and face to mesh with a pinion having one or possibly two teeth more or less than 16. However, a very careful check of the pattern would have to be made to determine this. From this it will be noted that to carry the necessary patterns for all combinations of bevel gears would be impossible.

By selecting listed bevel gears practically all of this expense is eliminated. Patterns are made and are used frequently. Complete drawings are kept on file. The saving of time as well as expense in executing an order is still further increased. In most installations bevel gears form only part of the reduction in speed. In fact, it might even be said that they are usually the second or third reduction, the first frequently being made by means of pulleys or spur gears, both of which can be readily manufactured in any reasonable ratio. For example, if a total reduction of 12½ to 1 must be had involving a bevel gear drive, it will be found advisable to commence with a standard listed pair of bevel gears, say 2½ or 3 to 1 for the second reduction, and make the first reduction by means of spur gears or pulleys.

It is usually much more economical to use rather small ratios of bevel gears, making most of the reduction where possible by spur gears. Bevel gears are much more expensive than spur gears, even if standard listed sizes are used. A bevel gear is not only more expensive than a spur gear when the pitch diameter, face and pitch are equal, but also the bevel gear will only transmit about three-quarters of the horsepower of a corresponding size spur gear. This increases the cost per horsepower still more, making the cost of bevel gears approximately twice the cost of spur gears figured on a cost per horsepower basis.

Trade Failures for Quarter Increase

A large number of commercial failures in the United States invariably occurs during the first quarter of a year, and 5,969 defaults were reported to R. G. Dun & Co., for the three months just ended. This is 10.8 per cent more than the number for the fourth quarter of 1924 and compares with an increase of 8.4 per cent in the first quarter of last year, when there were 5,655 failures.

The present total is 5.6 per cent above that for the corresponding period of 1924, and excepting the years 1922 and 1915, when 7,517 and 7,216 defaults, respectively, were shown, exceeds all previous records for the first quarter. With the large number of business concerns, however, it is pointed out, some increase in failures is logically to be expected.

At $128,481,180, the first quarter's liabilities are 14.2 per cent in excess of those for the fourth quarter of 1924, but are 30.5 per cent below $184,865,571 for the first quarter of that year, which represents the second largest amount for the period. Returns for the month of March show 1,859 defaults for $34,004,731, with the number, although larger than that for the short month of February, considerably less than the totals for January and last December.

The Floral Park Sand Company Operates Efficient Plant

Plant Operated by Two Men Produces 350 Cubic Yards Daily Plant Without Railroad Connection So Trucks Serve Market

THE plant of the Floral Park Sand Company is located at Elmont, Long Island, New York, approximately six miles from Jamaica, and is probably one of the most efficiently and economically operated of the small plants in that section, as it requires only two men and two motors to produce 300 to 350 cubic yards of material in a nine hour day.

The plant was designed entirely by F. W. Matthiesen, one of the present partners, and consists of a self discharging hopper 30 feet long by 10 feet wide and 15 feet high holding about 100 cubic yards of material. This hopper is again partitioned into three bins; number 1 for plastering sand, number 2 for concreting sand and number 3 for gravel. Sufficient clearance has been allowed for the Mack trucks to drive directly underneath. The plant is a trucking proposition entirely. It has no railroad connections and was built with this point in view. It is the intention of the Floral Park Sand Company, however, to store approximately 2,500 cubic yards of sand to be reclaimed in case of breakdown, by Green bucket and hoist.

The material is excavated by a ¾-yard Green drag scraper which in turn is handled by a double-drum H. and O. multiple hoisting engine driven by a 45 H.P. Waukesha gasoline motor. This hoist has Hyatt roller bearings throughout and has speeds of 400 and 200 feet. Owing to the fact that the electric feed line only allowed a 25 H.P. electric installation, it was necessary to install this part of the equipment in gasoline. The average haul is about 125 feet. This Green scraper discharges the material into a hopper which in turn feeds a 40 foot center bucket elevator. The buckets were manufactured by the Haiss Manufacturing Company. The buckets are spaced 15 inches apart on a belt supplied by the United States Rubber Company. This belt is 12 inches wide 6 ply rubber covered 32 ounce duck. This belt was sold as a conveyor belt but the Floral Park Sand Company converted it into a bucket elevator. There is considerable strain on the belt from the weight of the buckets and the steep angle at which the material is being elevated. The belt has been giving very satisfactory service however. This bucket

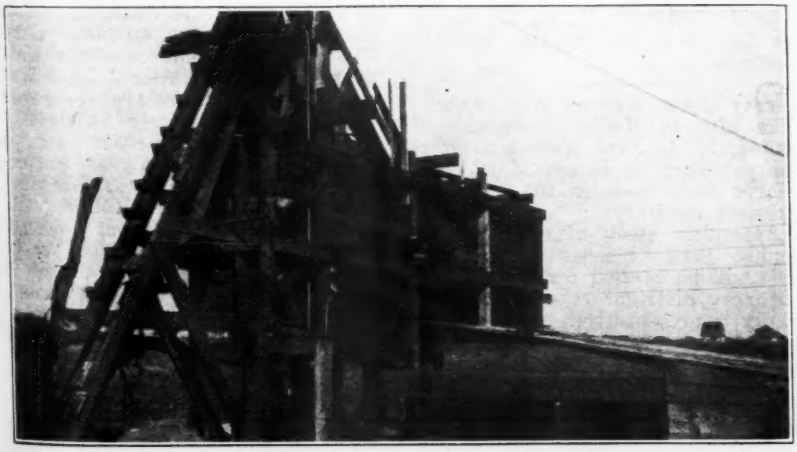
F. W. Mathieson and F. Weber, Partners Operating Floral Park Plant.

A Close-Up Showing Buckets Adjusted to What Really Is a Conveyor Belt.

Trucks Used in Delivery.

Bucket Elevator and Bins.

elevator is driven by a 10 H.P. 220 volts 2 phase 60 cycle General Electric motor directly connected, which discharges the material into a flat stationary screen set at an angle of about 33 degrees. This screening arrangement to most producers is the unique part of the plant. The plastering sand passing over a ⅜ inch mesh screen and the concreting sand over a ½ inch mesh screen, is directly deposited into their respective bins. However, this method of screening has proved 100 per cent efficient even during the winter months and throughout rainy weather. It does not require any attention whatsoever. It is free from clogging owing to the



Showing View of Bins.

fact that the material is perfectly clean. The deposit is stripped by a Fordson tractor and the overburden of about 12 inches removed. The sand has less than 1 per cent foreign matter and washing is therefore dispensed with. The Floral Park Sand Company is a co-partnership consisting of F. W. Matthiesen and F. Weber.

Death Takes J. W. Louder

The death of J. W. Louder on March 7th is a real loss to the cement industry with which he was connected for thirty years. Mr. Louder was a graduate of Lafayette College in 1895 where he pursued a special course in chemistry. He became chemist for the Atlas Portland Cement Company at their Northampton plant and in 1896 was made assistant superintendent of that plant which position he occupied until 1906. During that year he went to Rowelsburg, West Virginia, as superintendent of the Buckhorn Cement Company which plant is now operated by the Alpha Cement Company.

In 1908 Mr. Louder was made superintendent of the Nazareth Cement Company, which position he occupied until 1924 when he was made assistant to the president. At the time of his death he was manager of the Nazareth Cement Company. Mr. Louder had a thorough knowledge of cement manufacture both from a theoretical and a practical standpoint, and his ability was generally recognized not only in the Nazareth region but throughout the industry in the United States. His loss will be deeply felt not only by the Nazareth Company but by the industry in general.

Murray Opens Kansas City Branch

The Murray Rubber Company of Trenton, N. J., have opened a direct factory branch at Kansas City, Mo., to serve their trade in the west and southwest territory.

A complete stock of quality merchandise and mechanical Rubber Goods will be carried for distribution to Murray distributors at this point. Murray representatives will operate out of Kansas City district office instead of from the factory at Trenton, N. J.

Mr. R. M. Stuart, General Manager, Mechanical Goods Division of this company has appointed Mr. L. E. McCune, Kansas City District Manager.

A Car Loading Thought

"Since the organization of the Mid-West Regional Advisory Board, during the early part of 1924, there has been no serious car shortage in the territory covered by the board," said W. J. Womer, committee chairman, and while this situation is not due entirely to the board's activities, much credit is due to that body.

Mr. Womer said car shortages and freight congestions are largely due to terminal conditions. A special committee was appointed of which Mr. Womer is chairman, to make a survey of the car situation, in the Mid-West territory. The committee found one source of trouble was the condition in which cars are returned to the carriers by consignees; there being in many instances much waste material left in the car which necessitates a terminal move to some designated yard where the car is put in proper condition for further use. This involves considerable expense, beside the delay of the car from 24 to 48 hours. Mr. Womer's committee asked that all cars be completely unloaded including blocking, bracing, packing, waste material, etc., further that no foreign material be placed in cars.

The obvious results of such procedure will be not only an improvement in the physical condition of equipment furnished by railroads, but a marked reduction in and possible elimination of congestion in terminals.

Fire Waste Contest Last Year Reduced Losses in 265 Cities

The records show that as a result of the national fire waste contest conducted under the auspices of the Chamber of Commerce of the United States and the National Fire Waste Council there was an aggregate reduction of approximately $4,000,000 in the fire losses of 265 cities participating in the contest last year, compared with the loss in these same cities in 1923. The cities in question, with a total population of about 10,000,000, showed a reduction of 10.8 per cent in fire losses last year, though the property losses for the entire country increased. Their per capita loss in 1924 was $3.10, compared with $3.86, the average for the preceding five years.

Frank P. Callaghan, chief engineer for Foote Brothers Gear and Machine Company, left April 4th for Cuba on a business trip for the company.

The Meetings of the A. S. T. M. Non-Metals Committees

MEETINGS of twelve committees of the American Society for Testing Materials, in the Non-Metals Division, were held at the Bellevue-Stratford Hotel, Philadelphia, Wednesday, Thursday and Friday, March 25, 26 and 27. They were attended by about 200 members and visitors, comprising engineers and technical experts from the principal cement plants of the country, stone and gravel producers, tar and asphalt companies, public utilities, municipalities, and the Federal Government. The national officers of the Society, President, F. M. Farmer, New York City; Vice-President, W. H. Fulweiler, Philadelphia, and the Secretary-Treasurer, C. L. Warwick, Philadelphia, were present and addressed the meetings.

The Society is a national technical organization of some 3,600 members with headquarters at 1315 Spruce street, Philadelphia, formed for the purpose of promoting knowledge of the materials of engineering and standardizing of specifications and methods of testing engineering materials. The Society meets annually at Atlantic City in June. Between these meetings its work is carried on by about forty committees, who study various materials, conduct tests to advance knowledge of these materials, so that engineers may know better how to use them, and prepare standard specifications and tests to govern the interchange of these materials between the manufacturer or seller and the consumer or buyer. Because of the great commercial importance of this work on specifications, the committees are made thoroughly representative of both the manufacturers of the material or product and the users. Experts who are neither manufacturers nor users also serve on the committees. In this way the points of view of all three groups are brought directly into contact with each other and standards satisfactory to all parties of interest are reached.

The development of standard specifications for materials is of great industrial and economic significance in that by facilitating quantity production of materials of known quality and reliability these standards help to make possible economies in manufacture, distribution and use of materials that contribute in large measure to the profits of business and reduce to some extent the elements of danger resulting from too great a variation in specifications. On the side of the producer there are these advantages:

1. He is not compelled to supply, for essentially the same purpose, materials ordered to a variety of specifications.
2. The manufacturer can, in times of general business depression when his orders are low and buying is practically at a standstill, continue to produce "standard" material knowing that when business picks up there will be a market for it.
3. The adoption of standards reduces the variety of commodities that must be kept in stock by producers and distributors.
4. The producer knows exactly what he is expected to furnish and how the consumer will test and inspect the material.

Whatever benefits the producer indirectly is of advantage to the consumer. There are certain other specific advantages that the consumer experiences in the use of standards, as follows:

1. He can secure truly competitive bids on the same quality of material.
2. The details of purchasing are simplified and standardized.
3. Standard methods of test and inspection are of particular value in establishing a routine procedure for acceptance of material.
4. The greater uniformity and reliability of material purchased under standard specifications make possible its more economic use.

The membership of the Society comprises all groups interested in production and use of engineering materials. Included in the membership of 3,600 are about 200 individuals and companies in Philadelphia, among the latter being some of our leading manufacturers and public utilities.

The committees of the Society meet two or three times a year in various localities. From March 25th to the

27th, Philadelphia was host to twelve of these committees which met as follows:

Wednesday, March 25th
Committee C-1 on Cement
Committee D-15 on Thermometers
Committee D-16 on Slate

Thursday, March 26th
Committee C-8 on Refractories
Committee C-9 on Concrete and Concrete Aggregates
Committee D-5 on Coal and Coke
Committee D-8 on Bituminous Waterproofing and Roofing Materials

Friday, March 27th
Committee C-2 on Reinforced Concrete
Committee D-4 on Road and Paving Materials
Committee D-9 on Electrical Insulating Materials

In addition to the meetings of these twelve committees there was a meeting of the Joint Committee on Concrete Culvert Pipe.

These committees have reviewed their work for the past year and their findings and recommendations will be reported to the Society at its annual meeting in June at Atlantic City.

The following local committee was in charge of arrangements and entertainment:

L. R. Ferguson (chairman), Light, Hollister and Ferguson, Philadelphia.

D. K. Boyd, Structural Service Bureau, Philadelphia.

I. K. Giles, Atlantic Refining Company, Philadelphia.

E. H. Grafton, Quaker City Rubber Company, Philadelphia.

R. E. Hess, Assistant Secretary, American Society Testing Materials.

W. D. Lober, Vulcanite Portland Cement Company, Philadelphia.

H. S. Phelps, Philadelphia Electric Company, Philadelphia.

H. C. Porter, Chemical Engineer and Chemist, Philadelphia.

J. K. Rittenhouse, Assistant Treasurer, American Society for Testing Materials.

The committee considered methods of testing slate for water absorption, which have been in course of preparation since the annual meeting of the Society last June. These methods specify size, number and preparation of specimens, described in detail the procedure, that is, drying, initial weighing, immersion, computation and reporting of results, and make provision for an alternate method in which the standard 48 hours immersion in water is supplanted by boiling in water for eight hours. The committee has adopted test specimens 6 by 6 inches measured along the cleavage plane and ¼ inch in thickness. This form of specimen is more typical of slate in its method of application and use than the cubical specimen used for absorption test on such material as granite and marble.

There was considerable discussion regarding the preparation of the surface and the methods of drying after immersion, and the committee decided that the surface should be honed finished since such a finish would make possible more uniform results. It was also decided that surface drying after immersion should be done with a cloth instead of by the use of an electric fan as had been proposed by some members.

It has been proposed to require that six specimens be submitted, each to be representative of the particular kind of slate under consideration, as distinguished from selection of samples from different parts of a quarry, in which there may be variations in the slate.

The method will be referred to letter ballot of the committee and if approved will be recommended at the annual meeting of the Society in June for acceptance as tentative.

The committee next considered methods of flexure testing of slate under two headings: (a) Determination of Modulus of Rupture, and (b) Determination of Modulus of Elasticity. These methods specify in detail the test specimens and the procedure to be followed. Although it was originally proposed that the specimens for determination of modulus of rupture should be 12 by 4 by ⅜ inch, the committee finally decided, upon the recommendation of representatives of the electrical industry, to adopt a specimen 12 by 1¼ by 1 inch. The thickness of one inch represents a general standard of stock as used particularly in switchboard work, and it was pointed out that to adopt the thinner size would require splitting in order to obtain the thinner specimens. By adopting the one inch thickness, values are obtained that are comparable with the actual conditions of use of the slate.

It was also pointed out that the strength of slate was slightly different in the direction of the grain and crosswise to the grain, and accordingly the committee has decided to require of any lot of slate three tests with the grain and three tests cross-

wise to the grain; each specimen to be tested perpendicular to the plane of cleavage. This practice is very generally followed in the electrical industry.

In the tests of modulus of elasticity, the thinner specimen, that is, 12 by 4 by ⅝ inch, has been adopted because the determination of modulus of elasticity can only be made accurately with a specimen that is sensitive to deflection under load, and the 1 inch thick specimen adopted for the modulus of rupture test is not sufficiently sensitive for the determination of elasticity.

The committee also reviewed a paper by Mr. Robert Notvest of the Structural Slate Company, and Dr. H. S. Booth of the Western Reserve University on "The Testing of Slate for Hardness" which had first been presented to the committee in June, 1924, by Mr. Notvest. Because of its general interest and importance the committee has given authority to the authors to publish this paper, with the imprint that it was presented to the committee and has been issued under its authorization. The committee believes that this paper is a valuable contribution to the subject of hardness testing of slate and the paper will be studied by the committee with a view to preparing ultimately a method of hardness testing of slate.

Chairman Kessler referred to the benefit that had been derived at the meeting by the co-operation of the slate producers and pointed out the advantage which the work of the committee can be to the industry as a whole, not only through the development of methods of test, which are at present occupying the attention of the committee, but in other ways as well, as for example in the establishment of standards that could be used as a guide in the development of new quarry operations.

A subject that will engage the attention of the committee in the future is that of weathering or cloring in slate. It was reported at the meeting that the National Slate Association has been doing some work on this subject and Mr. Kessler agreed to report later on this feature, which is of special interest to architects and builders.

Committee C-1 on Cement also held a well attended meeting on Wednesday, March 25th, at which 40 of its members, coming from all sections of the country, were present out of a total membership of 59. General discussion centered upon the Society's Standard Specifications and Methods of Test for Portland Cement, which have been approved as American Standard Specifications by the American Engineering Standards Committee. The comments of many members and certain reports mentioned below brought out sharply that one of the biggest problems before the committee today is to devise further means for improving the degree of uniformity obtained in test of cement throughout the laboratories of the country. The committee has been at work upon a handbook or manual which elaborates in considerable detail the directions in the specifications for making the several tests called for, that is, fineness, soundness, time of set, and tensile strength. Mr. Ernest Ashton, Chemical Engineer, Lehigh Portland Cement Company, Allentown, Pa., a chairman of the sub-committee in charge of this matter, stated that the manual was practically completed and would be submitted in tentative printed form for consideration of the committee at its next meeting.

Another interesting feature of the meeting was the consideration by the committee of the recently proposed Master Specifications for Cement that have been issued by the Federal Specifications Board. The Master Specifications have not changed the actual requirements of the standard specifications but in many cases have elaborated upon the methods of testing in somewhat the same way that the committee itself has done in the above mentioned hand book. Reports from the following sub-committees are worthy of mention.

Sub-Committee on Specific Gravity.—The sub-committee has recommended that the requirements for specific gravity be dropped from the specifications. This recommendation has been approved by the committee and will be submitted to the Society at the time the other recommendations respecting the specifications are made.

Sub-Committee on Fineness.—Mr. J. C. Pearson, Assistant Chemical Engineer, Lehigh Portland Cement Company, Allentown, Pa., the chairman of the sub-committee, reported that they have been making some studies on the relation of fineness to strength and have presented some interesting data for consideration by the Sub-Committee on Strength. They have recommended the adoption by the committee of a few series of test-

ing sieves that are being brought out by Committee E-1 on Methods of Testing. The committee has planned a study of the standard Ottawa sand and the use of these new sieves with the object of so fixing tolerances that the present standard Ottawa sand may be used without modification.

Sub-Committee on Strength.—Mr. P. H. Bates, Chemist, Bureau of Standards, Washington, chairman, reported the results of an extensive series of strength tests made by seventeen co-operating laboratories. These tests included compression tests of cylinders and cubes and tension test of mortar briquettes, with different consistencies of mortar, different proportions and at different ages. The magnitude of this work will probably be appreciated by the fact that the number of specimens involved in this series alone is approximately 40,000. The results bear on the methods of testing but inasmuch as the sub-committee did not have an opportunity to work up this data, it is too soon to state any conclusions. In the meantime the sub-committee has been directed to tabulate and study this data, for which Committee C-1 has appropriated the necessary funds.

In this same connection Mr. F. H. Jackson, Senior Assistant Testing Engineer, U. S. Bureau of Public Roads, Washington, D. C., presented an interesting paper giving in detail results of a series of comparative tests in some fifty laboratories which bear upon the work of the Sub-Committee on Strength. One of the objects of this investigation was to determine the degree of conformity in applying the standard tests to identical samples prepared and sent out by the Bureau of Public Roads and tested in accordance with the standard methods. The purpose of the paper was to point out to Committee C-1 some of the methods of testing that needed elaboration.

As a result of the discussion of these two series of tests certain investigations supplementary to those now in progress were discussed and were referred to the sub-committee for consideration.

Sub-Committee on Natural Cement.—Mr. E. L. Conwell, President, E. L. Conwell and Company, Philadelphia, chairman of the sub-committee, reported progress and promised further information on the subject of natural cements at the next meeting.

So much business of importance developed at this meeting requiring further consideration of the committee before it could properly prepare its annual report to the Society in June that it was determined to hold another meeting in New York City on May 15th at which further data now in course of preparation will be reviewed and the committee's annual report prepared.

Tests for Fineness of Pulverized Coal.—The rapidly increasing use of pulverized coal in large central power stations has developed a need for satisfactory standard methods for testing the fineness of powdered coal. The use of powdered coal is perhaps the most important development of the last three years in power station work. The burning of powdered coal has many of the advantages of burning gas. It is flexible, the load can be quickly varied, and it is possible to use much lower grade coal than in ordinary methods of combustion. One of the most important factors in the use of powdered coal is its fineness, and Committee D-5 is engaged in a thorough standardization of the methods for testing powdered coal, including the question of fineness. In this work some consideration is being given to the methods used abroad, particularly in Europe. Representatives of European standardizing associations are in communication with the sub-committee of Committee D-5 in bringing about international standardization on this subject.

The Tentative Methods of Testing the Fineness of Pulverized Coal (d 197-24 T) were recommended for continuation as tentative, due to further work being conducted as to methods of collection of representative samples. The methods of sampling and the method of making the size test are to be written up as separate procedures so that the method of making the size test (which method appears to be satisfactory) need not wait until the details of sampling have been satisfactorily worked out.

Determination of Anthracite Coal Sizes.—The committee is co-operating with anthracite producers in standardizing methods for determining the sizes of anthracite coal. This work has been in hand for the past year and the sub-committee on this subject, Mr. J. H. McNally, Fuel Engineer, Pardee Brothers and Company, Philadelphia, chairman, submitted a report specifying the various screen openings to be used in testing domestic sizes of an-

thracite. This series of sieve openings is in accordance with the sizes for domestic anthracite operators. The sub-committee report was adopted by Committee D-5, including the sizes of screen openings recommended. The next step of preparing a standard method of procedure for sampling and making a size test was referred to the sub-committee on Methods of Testing, which sub-committee will work in conjunction with the Sub-Committee on Anthracite Sizes in developing a test method.

Preparation of Laboratory Samples.—Some minor changes were made in the standard methods of preparing laboratory samples of coal and coke for analysis. Hardened steel roll crushers were included in the allowable pulverizing apparatus specified for coke. Also, both the coal and coke methods were made to conform in that in either case 200 gram samples of 20 mesh material are to be taken for reduction to 60 mesh in preparing laboratory samples.

Definitions of Terms.—The tentative definitions for various kinds of coke, such as furnace foundry, by product, etc., were discussed and referred back to the sub-committee on Nomenclature and Definitions with instructions to drop most of these definitions on the grounds that the differences between such cokes are too indefinite to permit the formulation of definitions. In fact, there is no need for these definitions. The committee unanimously preferred the present tentative definitions for moisture to the one suggested by the general Society Committee E-8 on Nomenclature and Definitions.

Future Work of Committee D-5.—The committee is planning to carry on the following studies during the coming year:

1. Research in methods best suited for collecting representative samples of pulverized coal.

2. Preparation of methods for collecting representative samples of anthracite coal and methods of making size tests.

3. Preparation of standard methods for determination of cubic foot weights of coke and method of making size tests.

4. Investigation of methods for determination of total moisture in large samples of coal collected during conduct of boiler tests.

5. Investigation as to whether the determination of sulphur in the washings from a bomb calorimeter is sufficiently accurate to justify the inclusion of this method as an alternate standard in the standard methods of analyzing coal.

6. Investigation as to how nearly the present standard method for determination of fusibility of coal ash indicates clinkering tendencies of coal.

Committee C-9 on Concrete and Concrete Aggregates is proposing to revise its Tentative Methods of Securing Specimens of Hardened Concrete from the Structure (C-42-21 T) to include a table of reduction factors for specimens of varying ratios of height to diameter, so as to refer such specimens to the standard specimen having a ratio of height to diameter of 2 to 1. The Tentative Methods of Making Compression Tests of Concrete (C 39-21 T) are being recommended for advancement to standard.

A new sub-committee has been appointed on Design. There are at present a number of theories governing the design of concrete mixtures. It is the work of this new sub-committee to align these various theories. The committee is working on new specifications for aggregate and on specifications for concrete. In order to aid in the securing of data on available deposits of aggregates, a form has been prepared on which to record the essential information concerning any deposit. This should serve as a guide in getting specific information.

A sub-committee, which is carrying on a study of various natural or artificially occurring materials in concrete which may affect it deleteriously will compile as a first step a bibliography on the effect of these various deleterious substances. Such materials include organic impurities, impure water, etc.

Another sub-committee is studying the effect of various admixtures in concrete. It believes that its first efforts should be the preparation of a standard method for determining the weight per cubic foot of the various powdered admixtures, since at present there is no method that has been agreed upon as a standard method. It will carry out a series of co-operative tests in which nine laboratories will determine the weight per cubic foot of powdered talc, oil shale, hydrated lime and diotamaceous earth, by the rodding method and direct compression method and compression by means of jigging. The sub-committee will ultimately look into the ef-

fect of these powdered admixtures on the strength of the concrete, including in this investigation the effect of similar additions of portland cement.

The durability of concrete under various conditions is a subject of great economic importance. If some concrete will stand up much longer under a definite set of conditions than other concrete, it would be enlightening to know the reasons. It may be that certain precautions can be taken to insure greater durability. One suggestion to accomplish this is a soundness test for aggregate. This is a sodium sulphate test used to simulate freezing and thawing conditions. Any accelerated test would be very helpful.

At a luncheon on Thursday of the delegates attending the three day session of the American Society for Testing Materials at the Bellevue-Stratford Hotel, Mr. George S. Webster, a member of the Board of Engineers of the Delaware River Bridge Commission, told the members about the bridge and described the various features of construction. He referred to the fact that when completed the bridge will be the longest suspension bridge in the world and will have cost, including land damages, in the neighborhood of Thirty-seven Million Dollars ($37,000,000). Following the luncheon the delegates made an inspection trip of the bridge on both the Philadelphia and Camden sides, and then proceeded to the Delaware Plant of the Philadelphia Electric Company, returning to the hotel for a dinner at which they were addressed by the President of the Society, F. M. Farmer of New York City, who told the members of some problems that are facing the Society at this time as a result of the development and expansion of its activities.

At the meeting of Committee D-4 on Road and Paving Materials considerable attention was given to the question of subgrade soils. The committee is recommending a tentative field method for determining moisture equivalent of subgrade soils, which is the most indicative test of the suitability of the soil to serve as a subgrade of a road. By its use can be determined what special treatment may be given to the design of the pavement.

The committee voted to recommend to the Society at the annual meeting that the Tentative Method of Test for Consistency of Portland Cement Concrete for Pavements or for Pavement Base (D 138-33 T) should be advanced to standard as this test is significant in controlling the strength of concrete. It should be pointed out that it has been found that wet mixtures are greatly inferior in strength to those containing a lesser amount of water. By the use of this proposed method a higher quality and more concrete is possible.

A number of revisions of tentative and standard methods is under consideration, including revisions of the float test method of mechanical analysis of subgrade soils, standard method of test for specific gravity, standard method of test for distillatic and standard method of test for penetration. The revision of the latter method involves a change in the requirements for the penetration needle, which should make it possible to secure standard needles more readily than heretofore.

The committee is making a strong effort to produce a standard for commercial size broken stone, slag and gravel. There is possibility of considerable economy in the elimination of unnecessary screen sizes in commercial producing plants. At present, plants are forced to carry in stock a large number of screens, which could be replaced by a comparatively small number.

The committee is also engaged in the preparation of specifications for gravel, stone and slag for various types of construction and it is giving considerable study to the design and methods of testing bituminous concrete mixtures.

The registered attendance at the meetings was 214. The members of the committees were unanimous in their endorsement of these group meetings, of which this was the first for these particular committees. Such meetings will undoubtedly be a feature of the growing importance of the Society.

Zelnicker Bulletin

Bulletin No. 331, just issued by Walter A. Zelnicker Supply Company, St. Louis, Missouri, is a list of contractors' and miscellaneous equipment now in stock, including rails, switch material, track accessories, cars, shovels, cranes, locomotives and hoisting engines.

A new gravel plant will be erected by the Street Department of Haverhill, Massachusetts, to take the place of the old one abandoned.

Some Accident Statistics

A PROBABLE increase of six per cent in the number of industrial accident fatalities in the United States during 1924 is indicated by reports received by the National Safety Council from state labor departments and industrial accident commissions of 18 states. Such an estimate is open to question, says the Council, owing to the incomplete representation of states and the fact that several of the reports are for fiscal years ending June 30. However, it is fairly safe to assume that there was a slight increase in the number of industrial fatalities for 1924 over 1923, although the increase was less marked than that of 1923 over 1922.

With regard to non-fatal injuries, the meager statistics available seem to indicate a slight reduction in the actual number of personal injuries though not in frequency rates based on the number of man hours worked. It is well known that fewer persons were employed in American industries in 1924 than in 1923 although no accurate estimate of the decrease has yet been made.

Reports from individual companies in many lines of industry showing improved frequency and severity rates arouse hopes that the decrease was general throughout American industry, a hope that has received little encouragement from the state reports. The companies reporting reductions had, with scarcely an exception, made earnest efforts in accident prevention. One definite conclusion may be drawn from the somewhat inconclusive statistics presented —that accidents grow like weeds when there is no systematic effort to check them.

Another conclusion, one which has long since been realized by all interested in accident prevention, is the need of more uniform methods of compiling accident statistics by state departments. Several states were unable to supply accident statistics more recent than those for the calendar year 1923 and still others had no means of determining even the number of fatalities occurring in the state, to say nothing of the non-fatal injuries. State officials have shown the utmost willingness to cooperate with the National Safety Council by furnishing all available information but in many cases departments have been handicapped by insufficient appropriations to compile the necessary statistics.

There is also a wide diversion in the comprehensiveness of the statistics furnished by different states. In a few, all industrial accidents are included while in others railroads and mining casualties are omitted. In other states not all manufacturers are covered by the compensation laws. Some states report all injuries requiring medical attention while others list only compensation cases. This difference will be readily apparent in the accompanying table when the proportion of non-fatal injuries to fatalities is noted. Several states list all injuries, according to severity —permanent total disability, permanent partial disability and temporary disabilities according to time lost. The proportion of states keeping such detailed statistics, however, was not sufficient to include these sub-divisions in the table. It must be remembered of course that the experience of one state is not comparable with that of another but is of interest for comparison of the two periods.

Unlike the reports for 1923, the tendency is not universally upward. Several states showed reductions in the number of fatalities, the extent of the reduction perhaps indicating to some extent the curtailment of the number of man-hours worked. Others showed fewer non-fatal injuries but an increase in fatalities.

Part of the increase, though probably only a small percentage for the United States as a whole, may be due to the increasing strictness of state departments in securing reports of personal injury accidents. Harry L. Nelson, superintendent of the division of workmen's compensation of the Tennessee Department of Labor, states that part of the increase in the number of fatal accidents in Tennessee is attributable to increased efforts along this line. A similar opinion is expressed by David B. Henderson, chief of the division of accident prevention, Industrial Commission of Minnesota, who says in part:

"Accident data is misleading when trying to determine whether accidents are increasing or decreasing during a certain period of time, due to the fact that compensation laws are be-

coming more drastic and are better enforced, therefore making the reporting of accidents more accurate.

"At present more accidents are being reported than ever before due to the fact that employers are more careful in reporting. In the past we have found that many employers did not report any accidents unless the man drew compensation. Also, many employees are drawing compensation for accidents where in the past, due to the lack of enforcement of the law no damages were collected. I believe that this condition has existed in all parts of the United States and that it is erroneous to assume that industrial accidents are increasing in the United States. Due to the intensive accident prevention work undertaken everywhere, it is our firm belief that industrial accidents are decreasing, in spite of statistical data to the contrary. As the data secured becomes more accurate, we are sure that the decrease in accidents will be shown."

The increase in fatalities in Minnesota was due to the Crosby Mine disaster in February, 1924, in which 42 miners lost their lives. Among the most complete records received were those for Pennsylvania. These include mines and public service accidents as well as accidents occurring in manufacturing operations. All three groups showed reductions in both fatal and non-fatal accidents. Pennsylvania industries are widely diversified, including mining and represent a fair cross-section of American industry. In one respect, however, Pennsylvania differs from many states. A considerable proportion of the workers are employed by large concerns, particularly in the steel industry, which are active in accident prevention. Decreased industrial activities in such companies did not result in abandoning the safety program and freed from the problem of assimilating large numbers of new workers, were able to reduce accidents.

Fatalities in coal mining throughout the United States showed a reduction in the actual number of deaths but an increase in the fatality rate per million tons mined. The number of fatalities was 2,381 for 1924 and 2,458 for 1923, a decrease of 77, but the rate per million tons was 4.27 against 3.74 for the previous year.

Delaware reports an estimated decrease of approximately 10 per cent in the number of fatal and non-fatal accidents from the 1923 records. Wisconsin reports an increase of 8.7 per cent in the number of compensable cases closed during the year. The figures for 1923 and 1924, respectively, being 20,941 and 22,766. Figures for 24 principal industrial cities of the state for the two years (in which industries are undoubtedly better organized for accident prevention) show 13,747 compensable cases for 1923 and 13,707 cases for 1924, a decrease of 3/10 of 1 per cent. The ratio of machine accidents to all cases was 16.2 per cent, the lowest percentage on record.

A reduction in the total number of railroad casualties of all kinds for the first eleven months of 1924 as compared with the same period of 1923 is shown by the statistics of the Interstate Commerce Commission. During this period of 1924 there were 6,087 persons killed and 131,416 injured compared with 6,779 fatalities and 159,534 injuries during the same period of 1923. Fewer locomotive miles and fewer man-hours worked were reported by the railroads. Casualties per million locomotive miles for 1923 were 3.81 for fatalities and 31.02 per injury; for 1924 the rates were 3.62 and 27.76. For non-train accidents the rates per million man-hours worked were 0.40 for fatalities and 31.56 for non-fatal injuries against the 1924 rate of 0.33 and 27.77.

Industrial Fatalities and Accidents Reported to National Safety Council by State Departments 1923-24

State	1923 Fatal	1923 Non-fatal	1924 Fatal	1924 Non-fatal
Pennsylvania	2,412	200,435	2,209	177,539
*New York	662	57,416	1,109	.....
*Massachusetts	330	64,560	336	60,103
Oregon	178	30,013	142	25,811
Washington	401	35,523	407	39,095
Minnesota	181	39,358	221	37,901
*Montana	81	5,048	87	5,702
*Colorado	168	5,139	140	5,520
Tennessee	90	25,008	142	21,222
Nebraska	30	16,162	35	15,000
Rhode Island	39	4,098	31	3,758
Ohio	888	183,983	999	174,454
*New Jersey	290	49,002	283	47,958
Vermont	44	10,950	33	9,664
Virginia	145	9,183	163	10,088
Idaho	57	6,310	83	6,401
Maine	61	16,305	30	14,083

*Fiscal year ends June 30.

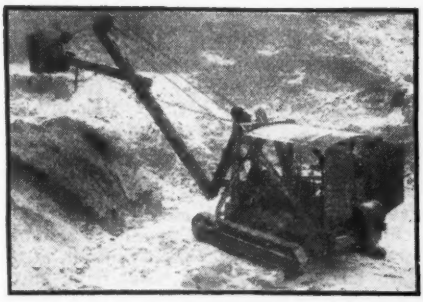
A new gypsum mill is planned for Okeene, Oklahoma.

The Byers Machine Company Adds Shovel to Bear Cat

The Byers Machine Company of Ravenna, Ohio, have recently perfected and added to their line of attachments for their "BEAR CAT" a half yard shovel, which is unique in design and which practically completes the rounding out of the attachments for the "BEAR CAT."

The BYERS "BEAR CAT" machine is a gasoline powered, full caterpillar unit, operating excavating and handling attachments of one-half cubic yard capacity, and is well known among the trade. The machine itself was first produced by this company about three years ago and has been produced on a basis of relatively high product since that time. The attachments have been designed and worked out from time to time until a complete line of eight attachments is now offered.

The latest of these attachments is the half yard shovel, which has been developed within the last year. The shovel is unique in that the crowding device is quite different from that usually found in gasoline shovels. The boom and dipper are both operated through live drums, the boom being raised and lowered to effect the crowd and to shake the dipper. A minute's consideration will show that in any shovel, the effective crowding thrust can only be as great as the weight of the boom regardless of the amount of power applied, since when sufficient power is applied at the shipper shaft of standard shovels to more than equal the weight of the boom applied at this point, the boom will simply be raised and no more thrust applied to the dipper. With this in mind. the dipper stick on the "BEAR CAT" is hinged to the boom directly, and the design so carried out that the operator has absolute control over the boom providing the maximum crowding effort in either direction and at the same time eliminating all the shipper shaft mechanism, crowd drums, etc., which are usually found in this equipment, thereby eliminating all wear at this point and reducing the cost by having eliminated this mechanism. The shovel has the same dumping clearance as the three-quarter yard machines, digs a very level floor when required; the dipper may be shaken to dump sticky material very efficiently and is proving highly satisfactory to both manufacturers and customers. A daily yardage between 300 and 400 yards per day may be usually expected and the manufacturers claim for the entire machine a very low first cost and low cost of operation.



The Bear Cat Equipped with Shovel.

Hoover Demands Test Case on Legality of Trade Statistics

Statistical service rendered by trade associations will be taken up by Secretary Hoover with Attorney General Sargent. Secretary Hoover declared that this time he will stick to the job of determining the legality of the complications and the dissemination of current statistical data by any organization in any industry. He has hopes that the new attorney general will see that a straight case involving these questions will be taken through the court. All the cases now pending involve an alleged conspiracy to use the data for the purpose of controlling production and prices.

Industrial Notes

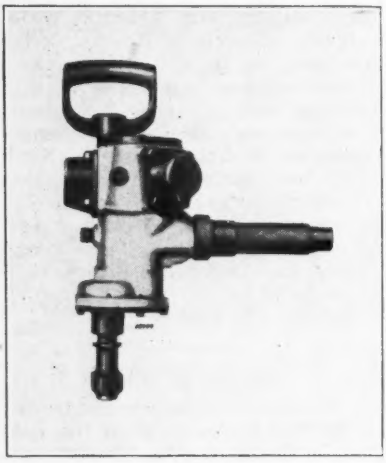
Lyle Marshall, former manager of the Service Department of the Industrial Works, Bay City, Michigan, and later connected with the Chicago office of that company, has recently been appointed district sales manager with new offices at 619 Dixie Terminal Building, Cincinnati, Ohio.

James E. Shearer, assistant sales manager of the Industrial Works, Bay City, Michigan, has moved his headquarters from the home office to the Industrial Works' New York office, 50 Church street, that city. George T. Sinks, in charge of the New York District, will remain in that position.

New Size "DD" Pneumatic Drill

A new size lightweight reversible pneumatic Wood Boring Machine has been brought out by the Ingersoll-Rand Company, No. 11 Broadway, New York. This new drill is known as Size DD and is suitable for Wood Boring up to 1 inch diameter holes. The construction of this machine is very similar to that of the other three cylinder drills which this company manufactures. These drills have proved so successful that this new size DD Drill was developed for wood boring work.

The features of this type of machine are briefly; special three cylinder motor; light-weight aluminum case, with steel bushings cast in place in all the bearing holes and the throttle hole; renewable crank pin sleeve; and cast iron cylinders which are renewable and interchangeable. The renewable cylinders are a valuable feature, as any cylinder after long service, may easily be replaced and the motor made as good as new at slight cost.



The three cylinder motor has the rotating parts all accurately balanced, eliminating vibration and reducing wear and tear on the machine. The drill is very economical in air consumption and cost of maintenance, is high powered, and, moreover, every part is readily accessible for inspection.

The details of the Size DD Drill are as follows:

Size .....DD
Average Working Speed.....705 R.P.M.
Weight (incl. grip handle and chuck) .....15 lbs.
Length of feed (with feed screw).2½ ins.
Dia. Wood Bit will drive.....1 in.
Length overall (with grip handle)15 ins.
Distance from side to center of spindle .....1 9/16 ins.
Size hose recommended.....½ in.

These drills are furnished with a spade handle and a bit chuck as standard. A breast plate or feed screw can be substituted in place of the grip handle when so desired and a drill chuck in place of the bit chuck and the drill so made adaptable for a wide variety of work.

McMyler No. 2 Steam Shovel

A new booklet issued by the McMyler Interstate Company of Cleveland, Bulletin No. 68, describes the New McMyler-Interstate No. 2 Steam Shovel. This shovel is rated at ⅞ cubic yards capacity. It is said to have an exceptionally large engine and boiler. The main hoist engine has two cylinders of 6-inch bore and 8-inch stroke. The boiler is 48 inches in diameter and 7 feet, 6 inches high. In contrast to some types of steam shovels, the No. 2 has as standard equipment double power drums and a self-locking worm driven boom hoist. This machine can be converted from a ⅞-yard shovel to a 10-ton locomotive crane in one hour or less.

Turntable and carbody are of extra heavy box section steel castings. Gears are of forged or cast steel, all shafts of hammered steel. Accessibility is a big advantage in No. 2 shovel. Practically any shaft can be removed without disturbing adjacent shafts.

Every No. 2 is completely equipped with two independent power drums with steam clutch control on each, and a worm-driven boom hoist. The bulletin is liberally illustrated with engravings in sepia.

American Hoist & Derrick Co., St. Paul, Minn., has issued a new general catalog and a new catalog on locomotive cranes. Both are now ready for distribution to those interested.

Bonnot Co., Canton, O., in a catalog describes pulverizing coal to obtain proper combustion, through the use of its ball mill equipment, including mill, classifier, air separator and exhaust. Details of construction and typical installations are presented.

Free Service to our readers

For the convenience of readers who are in the market for equipment, our "Free Service" department will furnish on request any information, catalogs and prices on any machinery, equipment or supplies used in pits and quarries. The coupon below makes it easy fo you. Simply check, sign and mail.

Pit & Quarry, Rand McNally Bldg., Chicago, Ill.

Pit and Quarry, Research Department,
Rand McNally Bldg., Chicago, Ill.

WE ARE IN THE MARKET for the items checked below, and would be glad to receive catalogs, prices or other information.

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- ☐ Air Compressors
- ☐ Air Compressors, Portable
- ☐ Babbitt Metal
- ☐ Baffles
- ☐ Bag Filling Machines
- ☐ Bag Sewing Mach.
- ☐ Bags, Cotton
- ☐ Bags, Paper
- ☐ Barges
- ☐ Barrels, Steel
- ☐ Belt Fasteners
- ☐ Belting, Conveyor
- ☐ Belting, Transmission
- ☐ Bin Gates
- ☐ Bins, Clay Tile Storage
- ☐ Bins, Concrete Storage
- ☐ Bins, Steel Storage
- ☐ Blasting Fuses
- ☐ Blasting Powder
- ☐ Block Machinery, Concrete
- ☐ Boiler Compound
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- ☐ Boilers
- ☐ Brick Machinery, Concrete
- ☐ Buckets, Conveyor
- ☐ Buckets, Grab
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- ☐ Burners, Oil
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- ☐ Cableways
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- ☐ Car Replacers
- ☐ Car Wheels
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- ☐ Cars, End Dump
- ☐ Cars, Side Dump
- ☐ Cars, Steel Gondola
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- ☐ Chain, Steam Shovel and Dredge
- ☐ Chaser Mills
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- ☐ Classifiers
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- ☐ Clutches
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- ☐ Conveyor Equipment
- ☐ Conveyor Rollers
- ☐ Couplings, Flexible
- ☐ Cranes, Electric Traveling
- ☐ Cranes, Jib
- ☐ Cranes, Locomotive
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- ☐ Crusher Parts
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- ☐ Crushers, Gyratory
- ☐ Crushers, Hammer
- ☐ Crushers, Jaw
- ☐ Derrick Swingers
- ☐ Derricks
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- ☐ Draglines, Revolving Boom
- ☐ Dragline, Scraper
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- ☐ Dredges, Land
- ☐ Dredges, Sand Suction
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- ☐ Drilling Contractors
- ☐ Drill Sharpening Machines
- ☐ Drills, Blast Hole
- ☐ Drills, Hand Hammer
- ☐ Drills, Tripod
- ☐ Dryers, Sand and Stone
- ☐ Dry Pans
- ☐ Dump Wagons
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- ☐ Engines, Power Plant
- ☐ Engines, Steam

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- ☐ Hoists, Derrick
- ☐ Hoists, Drum
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- ☐ Hydraulic Pipe
- ☐ Hydraulic Pumping Engines
- ☐ Hydraulic Valves (Pulpit and Indicator)
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- ☐ Industrial Railway Systems
- ☐ Kettles
- ☐ Kilns, Cement
- ☐ Kilns, Lime
- ☐ Lights, Carbide
- ☐ Linings, Bag and Barrel
- ☐ Loaders, Bin, Portable
- ☐ Loaders, Boom and Bucket
- ☐ Loaders, Box Car
- ☐ Loaders, Conveyor
- ☐ Locomotives, Electric
- ☐ Locomotives, Gasoline
- ☐ Locomotives, Steam
- ☐ Locomotives, Storage Battery
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- ☐ Manganese Steel
- ☐ Manganese Steel Parts
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- ☐ Metal, Perforated
- ☐ Meters
- ☐ Mills, Chaser
- ☐ Mills, Tube
- ☐ Mixers, Concrete
- ☐ Mixers, Plaster
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- ☐ Motors, Gasoline
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(See other side)

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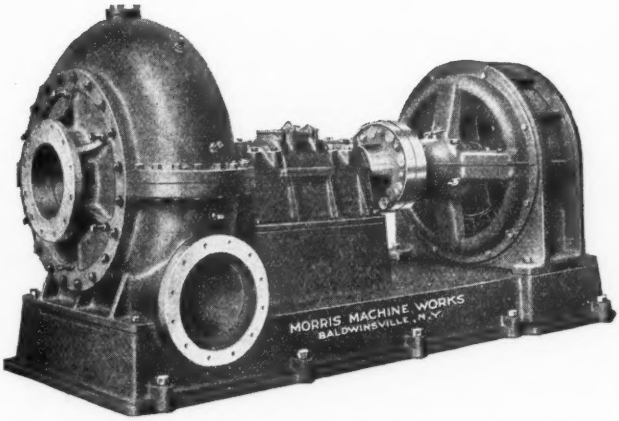
Morris Pumps again highly endorsed!



THE Detroit plant of the Peerless Portland Cement Co., now under construction, will have a capacity of a million and a half barrels per year and is to rank among the world's best plants of its kind.

At every pumping point between the various mixing and storage tanks, the slurry will be handled by Morris Pumps. Each pumping station is to be provided with two pumping units, of which the additional one will be used as an auxiliary.

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Morris Engineers, with 61-year operating data from successful Morris installations, are always ready to asssit in selecting correct units and their prelimnary advice is free. Tell us your needs or at least ask for Bulletin 20.

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Originators of Centrifugal pumps, both single and multi-stage, and builders for practically all purposes since 1864

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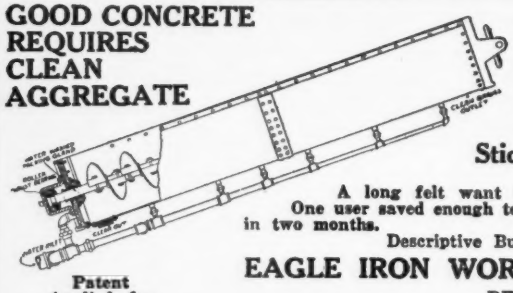

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The EAGLE WASHER

Removes Mud Balls, Sticks, Coal and Shale.

A long felt want that actually does the business. One user saved enough to pay for the cost of this washer in two months.

Descriptive Bulletin now ready

EAGLE IRON WORKS, Des Moines, Iowa

DEPT. P

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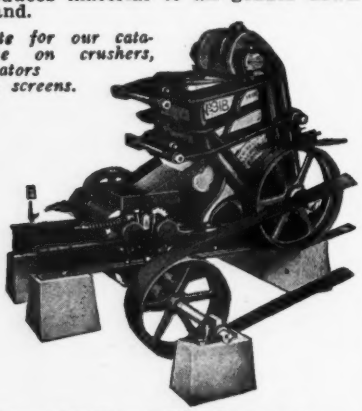
Powerful Stroke and Great Capacity

For crushing service that handles both heavy and fine work, the New Holland is conspicuous among rock crushers.

It runs easily—has no hot bearings—and produces the least possible dust. It reduces material to all grades down to sand.

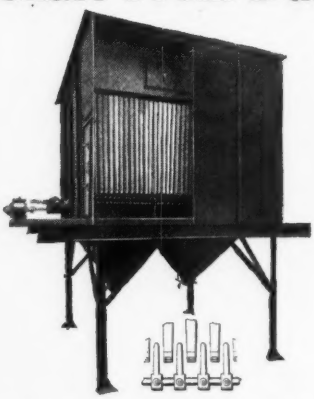
Write for our catalogue on crushers, elevators and screens.



New Holland Machine Co.

Franklin St., New Holland, Pa.

Dollars From Dust



The Paxson Dust Collector collects 98% of the fine powder which floats in the air.

In many industries this collection of dust represents a direct saving of money—resulting from the recovery of otherwise lost values, and from the increased efficiency of labor as affected by improved sanitary conditions.

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We are a going concern. YOU get the best Dust Collector. We can deliver the goods.

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Realizing what a tremendous factor time is on many construction jobs, we have established storage yards at points from which we can make the quickest possible delivery of both rails and equipment to any part of the country. Purchasers of H-M rails or equipment, therefore, enjoy the fullest advantages of greatest speed and substantial savings in hauling charges.

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Rails and equipment bearing the H-M stamp are invariably the choice of experienced buyers

We always have locomotives of every type in I.C.C. condition ready for immediate delivery at prices that mean big savings to the user.

Every engine in our yards has been overhauled, tested under steam and put in first class condition.

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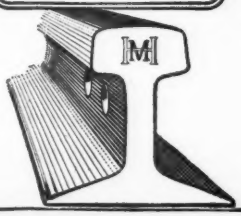
All in serviceable condition.



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Good Used Equipment — Hudson Terminal Bldg. NEW YORK — Clean Business Methods

FOR SALE OR RENT

STEAM SHOVELS

1—½-yd. type A Erie on caterpillars new 1922.
1—¾-yd. type B Erie on caterpillars new 1922. No. 1769 high lift.
1—¾-yd. type B Erie on caterpillars new 1924, high lift.
1—¾-yd. type B Erie on traction wheels, not high lift. Sold very cheap.
1—¾-yd. type B Erie on traction wheels, high lift No. 1254 with or without crane boom and fairleads for dragline.
1—⅞-yd. Al Thew on traction wheels A.S.M.E. boiler new 1918.
1—1-yd. 30-B Bucyrus on caterpillars, new 1922.
1—No. 4 Keystone Excavator, new 1922, Serial No. 4296 with skimmer scoop and trench bucket.

CRANES & EXCAVATORS

1—No. 206 P & H gasoline on caterpillars with 38′ boom for clamshell or with fairleads for dragline.
1—Class 14 Bucyrus full-revolving caterpillar 63′ boom, 2-yd. dragline bucket.
1—5-ton traction wheel steam Crane.
1—20-ton 8-wheel D. D. O. & S. Locomotive Crane, 53′ boom, standard gauge.

HOISTS (STEAM)

1—No. 3½ Dake Swinger.
1—6¼x10 three drum and boiler Mundy.
1—7x10 single drum Skeleton Lidgerwood.
1—7x10 D. D. Lidgerwood and Boiler.
1—8½x10 three drum and boiler Lambert.
1—8x12 D. D. and extra large Boiler Mundy.
1—10x12 D. D. and Swinger Skeleton Lidgerwood.

HOISTS (ELECTRIC)

1—22 H.P. two drum Flory.
1—40 H.P. three drum and Swinger National.
30—Electric Swingers with new motors for 3Ph. 60C. 220V, or 440V, or without electrical equipment.

DERRICKS

1—20-ton 70′ boom Steel Guy.
1—10-ton 70′ boom Timber Stiff Leg.
1—7½-ton 92′ boom Timber Stiff Leg.

BUCKETS

2—½-yd. Handler type Lakewood Clamshell.
1—¾-yd. Blaw Knox Speedster Clamshell.
1—¾-yd. Handler type Lakewood Clamshell.
1—¾-yd. Williams Favorite Clamshell.
1—¾-yd. Blaw Knox Bulldog with teeth Clamshell.
1—1-yd. Digger type Lakewood Clamshell.
1—1½-yd. Class E Regular Bowl Hayward Clamshell.
1—15 cu. ft. Hayward Orange Peel.
1—¾-yd. Page Dragline.
1—1¼-yd. Page Dragline.

PAVER

1—21 E Koehring Paver on caterpillars, Serial No. 7318 with batch meter.

Also Cars, Locomotives, Scows, Dredges

Gravel Plant Machinery

80 H. P. portable **Boiler**

Mile 35 **Rail**

10x16—36″ gauge saddle tank **Locomotive**

Ten K & J 4 yd. 36″ gauge **Cars**

750 and 1,000 G. P. M. **Centrifugal Pumps**

100 H. P. 3 ph. 60 cycle electric D. D. **Hoist**

Slack line **Cableway**

Incline **Belt Conveyor**

Champion **Jaw Crusher**, manganese fitted.

HACKLEY-MORRISON CO.
Richmond, Va.

FOR SALE

LOCOMOTIVE CRANES

1—5-ton Brownhoist, 4 wheel, 35 ft. boom, single drum, ASME and Mass. boiler.
1—15-ton Brownhoist, 8 wheel, 55 ft. boom, double drum, ASME and Mass. boiler, MCB coupler, overhauled.
1—15-ton Brownhoist, 8 wheel, 36 ft. boom, double drum, MCB coupler, overhauled.
1—15-20-ton McMyler, 8 wheel, 50 ft. boom, double drum, MCB coupler, overhauled.

COMPRESSORS

1—300-ft. National Brake and Electric Co. Direct connected to Westinghouse 54 H.P. Slip ring motor, 3 phase, 60 cycle, 220 volt.
1—1205 ft. Ingersoll-Rand, steam driven, steam cylinders 16x18, air cylinders, 16¼x25¼x16 in. stroke.

BUCKETS

1—¾-yard clamshell.
1—1-yard clamshell.

—✦—

BLEIER-GALER EQUIPMENT CORP.
94-96 Park Place, New York City

"WE BUY, REBUILD, SELL OR RENT"

CARS

12—Western 4-yd. 36-inch gauge, 2-way dump cars, completely rebuilt, all new wood.
12—2-yd. Western 2-way Dump cars, 24" ga.

CRANES AND DRAGLINES

1—Brownhoist Combination, Crane and Dragline on caterpillars, 40' boom, steam.
1—20-ton Browning 8-wheel Locomotive Crane, 50' steel lattice boom, bucket operating, electric lights and outriggers. One year old.
1—Byers Auto Crane, steam, on traction wheels, 30' boom.
1—0 & S Locomotive Crane, 15-ton, 8-whee', 40' boom, M.C.B.
1—Industrial Locomotive Crane, 20 ton, 50' boom, M.C.B.
2—Erie Combination Steam Shovel & Crane, on tractine wheels. 1 on caterpillars.
1—Northwest model 104, 45 ft. boom, 1 yd. Page bucket, on caterpillars.
1—Model 210, P. & H., with 50 ft. boom, 1¼ yd. Clamshell bucket, on caterpillars, gasoline.

CRUSHERS

1—No. 5 Austin Gyratory, standard drive.
1—No. 3 Telsmith Gates Gyratory Crusher.
1—12x36 Universal Jaw Crusher.
1—10x20 Climax Jaw Crusher on trucks.
1—9x14 Climax Jaw Crusher, on trucks, with elevator bins and engine.
1—9x15 Galena, Blake type Jaw Crusher.

CABLEWAYS AND BUCKETS

1—1½-yd. Sauerman slack line Cableway outfit, complete for 750' span, with Thomas Steam Hoist and Sauerman mast.
1—Complete 1-yd. Pioneer cableway excavator outfit, back dump bucket.
1—¾-yd. Sauerman Slackline Bucket.
1—3-yd. Green Dragscraper Bucket.

HOISTS

We have in stock over 100 Steam and Electric Hoisting Engines; single, double and triple drum.

Also complete line Swinging Engines and double drum Belt Hoists for Dragscraper work.

DERRICKS

Large number of practically new American Hoist & Derrick Co. Stiff Leg Derricks, mast 16x16x40 ft., boom 14x14x80 ft., trussed, stiff legs 14x14x55-ft. or 60-ft., bull wheel steel 16-ft. in diameter. We can furnish these either single line or bucket handling, complete with all fittings, or will sell complete set of fittings separate.

Also large number of Guy Derricks ranging in size from 12x12x40-ft. boom to 14x14x80-ft. boom with mast to correspond.

STEAM SHOVELS

1—Erie B, caterpillar, ¾-yd. dipper. Like new.
3—Thew on traction wheels; 2—⅝ yd. dippers; 1—⅞ yd. dipper; horizontal crowding motion and shipper shaft.
2—Keystone Excavators, traction wheels, steam, 1 No. 4, 1 No. 3.

LOCOMOTIVES

2—Standard gauge; 1—6 wheel 16x24 Baldwin switcher with tender, 42 tons on drivers. 1—10x16 Davenport, 20 ton.
16—24" and 36" gauge Steam and Gasoline 3 to 18 ton—Porter, Baldwin, Vulcan, steam; Whitcomb and Plymouth gasoline.

EQUIPMENT CORPORATION OF AMERICA

PITTSBURGH, 860 Empire Bldg. **CHICAGO, 1460 Roanoke Bldg.**
PHILADELPHIA, 660 Land Title Bldg.

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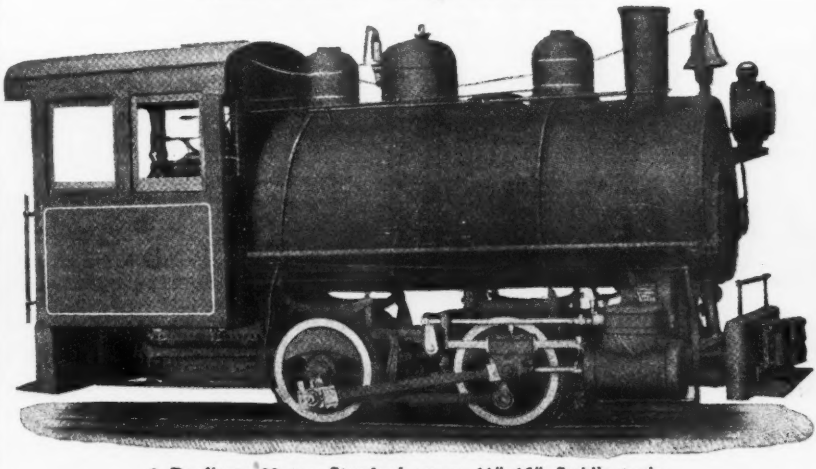

3 Duplicate 22 ton Standard gauge 11"x16" Saddle tanks

OVER HALF A MILLION DOLLAR STOCK OF EQUIPMENT OWNED BY US, REBUILT IN OUR OWN SHOPS; READY FOR IMMEDIATE SHIPMENT.

LOCOMOTIVES: Narrow and standard gauge, all types, 5 to 125 tons. ALSO STEAM SHOVELS, LOCOMOTIVE CRANES, CARS, COACHES, RAILS, ETC.

(Locomotive Repairs)

SOUTHERN IRON & EQUIPMENT CO (EST. 1889) ATLANTA, GA.

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LOCOMOTIVE CRANE

1—25-ton 8-wheel Industrial locomotive crane made by Industrial Works, M.C.B. Standard, 50 ft. boom. Crane in daily operation at our plant.

PITTSBURGH PLATE GLASS CO.
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FOR SALE

Dragline Excavators

2—MONIGHAN 2-T WALKERS, 60 ft. and 70 ft. booms, 2-yd. buckets, 70 H.P. Charter Engines, Type R.

2—BUCYRUS Class 175 Draglines, full electric, 130 ft. and 150 ft. booms, 5 and 6 yd. buckets.

1—BUCYRUS Class 24 Dragline, full electric, 100 ft. boom, 5 yd. bucket.

For further information write

W. E. CALLAHAN CONSTRUCTION COMPANY
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NEW ROLLER CHAIN at BARGAIN PRICES

15,000 feet Link Belt Chain. Their specification No. R.C. 126.

21,000 feet Whitney Mfg. Co.'s chain, their specification No. 471.

Size 1¼" Pitch, ⅝" Width, ⅝" Diameter. 13,000 lbs. Av., Ult. Strength.

Will furnish in any quantity

BRIGGS & TURIVAS
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2—Model 80 Marions.
2—Model 60 Marions.

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1—P.R.R. 75-ton Shifting Type.

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1—Bucyrus Model 110C with 3½ yd. Manganese Dipper.

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1—Atlantic Model 45 with 2½ yd. Manganese Sand Dipper.

All in excellent working condition, now in service but available for prompt delivery.

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WANTED CRUSHING ROLLS

One set crushing rolls to crush silica rock 18, 20 or 24" face, 24, 26 or 28" diameter. Also, one set crushing rolls to crush silica rock 26, 28 or 30" face, 30 to 40" diameter. These rolls must be in first class condition. State manufacturer of rolls, conditions of rolls and price.

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TWO DAVENPORT 36" Gauge saddle-tank locomotives, cylinders 10x16", weight 18 tons, A-1 Rebuilt condition. Immediate delivery.

ATLANTA LOCOMOTIVE & EQUIPMENT CO.
Fourth National Bank Bldg.
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1—50-ton American 6-wheel switching locomotive, with separate tender, built 1909.

1—50-ton Baldwin 6-wheel switching locomotive with separate tender, built 1907.

1—21-ton Davenport 4-wheel saddle tank locomotive, built 1908.

1—24-ton Porter 4-wheel saddle tank locomotive, 36" gauge, built 1912.

1—18-ton Vulcan 4-wheel saddle tank locomotive, 36" gauge, built 1918.

1—30-ton McMyler 8-wheel, 2-line locomotive crane.

1—18-ton O. & S. 8-wheel, 2-line locomotive crane.

500 tons 75-lb. relaying steel rail.
1000 tons 85-lb. relaying steel rail.
Also, other locomotives, locomotive cranes, steel rails, etc. List furnished on request.

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Purchasing as we do, from Railroads and Industries all over the Country, in quantities large and small, OLD FREIGHT CARS and LOCOMOTIVES for Re-sale and Wrecking Purposes we represent a truly logical source of supply for your needs of Second Hand or Cheap Freight Equipment—regardless of your location or the quantity.

Our policy is Quick Turnovers so your inquiries to us may save you real money.

We operate in Chicago a 20-Acre Freight Equipment Handling Plant with all Modern Facilities.

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Railroad Cars and Equipments
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Scrapped Iron in all its Forms.
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Industrial Plants and Equipment

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FOR SALE—No. 8 Style "K" Gates Crusher

We have on hand one No. 8 Style "K" Gates Crusher, Sale No. 6743. This is a right angle, right hand drive machine, fitted with corrugated chilled iron head 23¼"x40", and sectional chilled iron concaves 2½"x2½"x2⅞". Crusher was originally sold in 1911, was used approximately 22 months, and is in excellent condition; including an extra eccentric and bevel wheel. We will make delivery of this crusher anywhere on our line in its present condition. For further information address

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OFFICE OF GENERAL PURCHASING AGENT
80 East Jackson Boulevard, Chicago, Ill.

Air Compressor
Equal to New

Chicago Pneumatic Air Compressor 20x14", type O.D.B., capacity 2290 feet, belt driven by 250 H.P. General Electric Motor. Can furnish either with or without motor.

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AIR COMPRESSORS

Motor Driven Direct Connected:

1583 ft. Ingersoll, "PRE-2", 3 phase, 60 cycle, 2200 volt.
2100 ft. Ingersoll, "PRE-2", 3 phase, 60 cycle, 2200 volt.
1308 ft. Chicago, "OCE", 3 phase, 60 cycle, 2200 volt.
1290 ft. Chicago, "OCE", 3 phase, 25 cycle, 440 volt.

Belt Driven:

177 ft. Ingersoll, "ER-1".
360 ft. Chicago, "NSB" with motor complete.
528 ft. Ingersoll, "ER-1".
599 ft. Ingersoll, Imperial "XB-2".
1190 ft. Ingersoll, Imperial "XB-2".
1145 ft. Chicago, "OCB".
1500 ft. Ingersoll, Imperial "XB-2".

Send us your inquiries.

PITTSBURGH PNEUMATIC MACHINERY CO.
507 Liberty Ave., PITTSBURGH, PA.

A Fractional HP Motor or a Complete Power Plant

SAVE 35 to 45%

Buy Properly Rebuilt Electrical Power Equipment

Every machine completely overhauled and tested — Guaranteed

Write for Stock Bulletin

The FUERST-FRIEDMAN Co.
CLEVELAND, OHIO

CRUSHER BARGAINS

1—No. 7½ Austin Gyratory Crusher.
1—No. 12 Gates Gyratory Crusher.
1—No. 4 Austin Gyratory Crusher.

All A-1 condition and low prices

Address Box 30, Pit & Quarry, 538 S. Clark St., Chicago.

Used Equipment

8¼"x8" S.D.D.C. Lidgerwood Hoists.
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10"x6"x12" Horizontal Duplex Pumps.
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88 ft. to 92 ft. Masts, 23 in. Dia. at center.
42 ft. to 52 ft. Booms, 12 in. Butt, 9 in. at end.
Steel and Wood Blocks, 8" to 14" sizes.
Large assortment Steel Tanks.

WESTERN MARINE AND SALVAGE COMPANY,
Desk S Alexandria, Virginia

FOR SALE

1—Model 7? Osgood Steam Shovel No. 299.
1—Model 80 Marion Steam Shovel No. 876.
1—Model 0 Thew Steam Shovel No. 640.
10—4-yd. 36" guage, two-way dump cars.
2—20 HP. Locomotive type boilers.
1—No. 1 O'Laughlin Revolving Screen.

CASPARIS STONE COMPANY
Clinton Bldg., Columbus, Ohio

REBUILT EQUIPMENT

1—No. 4½ Champion Jaw Crusher. Price, $750.00.

1—9x15 Blake Jaw Crusher. Price, $650.00.

1—10-ton, four-wheel "Browning" locomotive crane with wide and standard gauge wheels mounted on the same axle and 46' boom. Price, $2,000.00.

THE DAY & MADDOCK COMPANY
West 82nd St., South of Denison Ave.
CLEVELAND, OHIO.

CRANES

1—NORTHWEST full revolving GASOLINE CATERPILLAR CRANE, new January, 1925, 40 ft. steel boom, bucket operating; used sixty days, perfect condition.
1—20-ton, 8-wheel BROWN HOIST Loco. Crane, No. 8247, built 1921, A.S.M.E. boiler, 50 ft. boom, bucket operating, rebuilt like new.

STEAM SHOVELS

1—TYPE B ERIE, full revolving, new October, 1924, ALL STEEL CATERPILLAR, ¾-yd. dipper; HIGH LIFT, used five days, like new.
1—14-B BUCYRUS, full revolving, new 1921, ALL STEEL CATERPILLAR, ¾-yd. dipper; boom 18 ft., overhauled, new dipper handle, $3,750, W. Va.

GREY STEEL PRODUCTS COMPANY
111 Broadway New York, N. Y.

3—3½-yd. SHOVELS

RAILWAY TYPE

Crushers—10, 9, 8, 7½, 6, 5, 4, 3 Roll Crushers
84"x72", 36x60, 54x24, 18x30 Jaw Crushers
24x36, 22x52, 18x36, 12x20

Disc Crushers 48", 36", 24", 18"
New 78x20 and 78x25 Screens
Pulverizers—Elevators—Kilns
120 H.P. Gasoline Engine

Ross Power Equip. Co.
13 So. Meridian St. Indianapolis, Ind.

Relaying Rails
WITH ANGLE BARS

3,500 tons 70 lb. section ASCE.
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Will pass any inspection.

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EVERY ARTICLE GUARANTEED BY US.

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Two Sullivan Steam Drills No. 38-F, Shop Numbers 20,482 F.S.3 and 15,022 F.S.3. These drills only slightly used and thoroughly overhauled in our own shop. A bargain at $150 each.

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1—200 H.P. Gas Producer.
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Thew Type Steam Shovel A-1. Shop No. 856, 40-ft. clam boom, also equipped with a 21 ft. shovel boom for excavation work. This shovel is on traction wheels, about ten years old, but has had very little use. It is one of the assets belonging to a Receivership and must therefore be disposed of as soon as possible. Originally cost $9,000. No reasonable offer refused.

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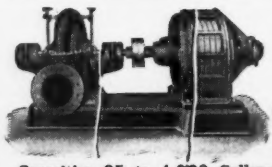

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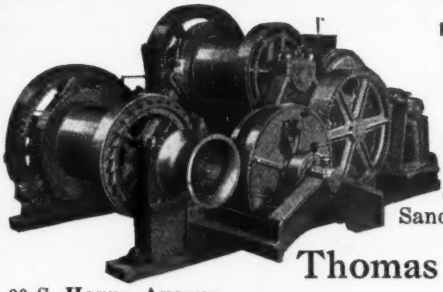

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Steam and Electric

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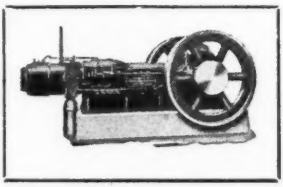

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Horizontal accessible design with adjustable cross-head.
Cost least for repairs.
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One gallon lubricating oil operates 90 h.p. for 33 hours.
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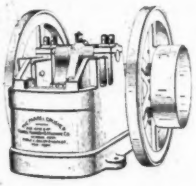

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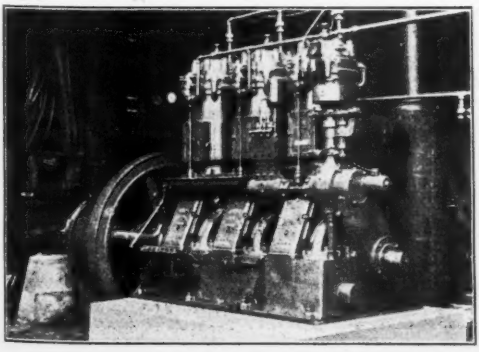

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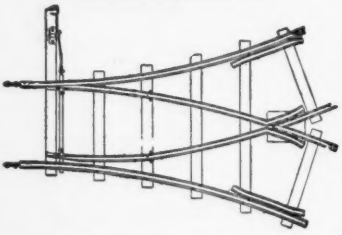

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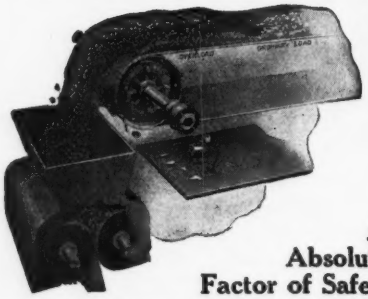

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One piece of scrap iron may cost you more in crusher repairs than the price of this inexpensive magnetic device.

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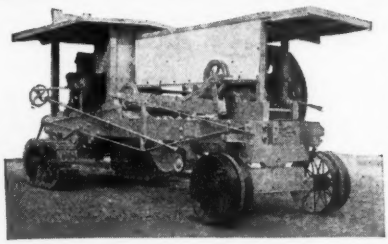

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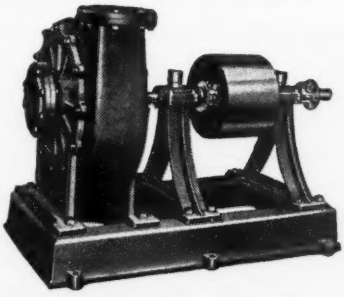

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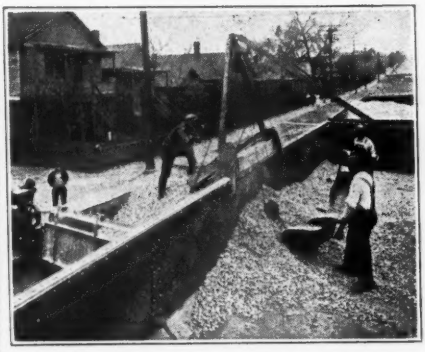

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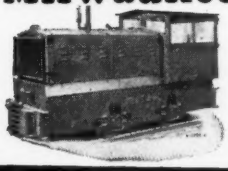

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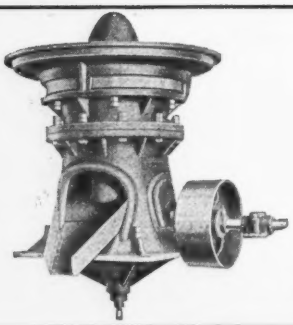

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Capacities, 5 to 300 tons per hour

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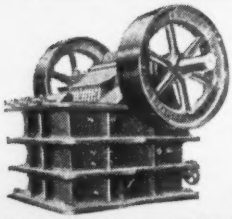

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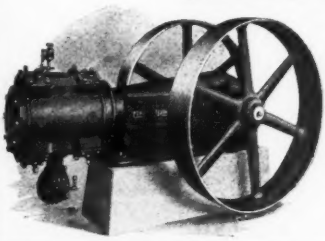


"He told me frankly that it was the best all around air compressor that he had ever seen or had anything to do with." This was said of a PENNSYLVANIA Air Compressor.

Let us quote on one of this kind or send you **Bulletin No. 123.**

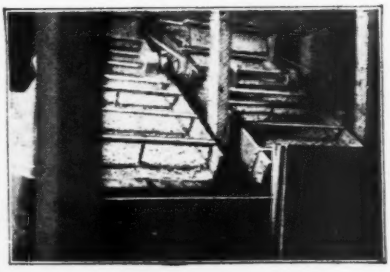
PENNSYLVANIA PUMP & COMPRESSOR CO.
Main Office and Works: Easton, Pa.

The Tornado

of March 18th only slightly damaged our plant and we are, therefore, in position to give our usual prompt attention to your orders for—

EGYPTIAN products, such as Grey Iron, Semi-Steel and Bronze Castings, Shaker Eccentrics, Car Wheels, Sheave Wheels, Reid Safety Frogs, etc.

EGYPTIAN IRON WORKS
Murphysboro, Illinois



UNIVERSAL VIBRATORS

The Most Economical Screens Made

Low Price
Low Power Cost
Low Up-keep

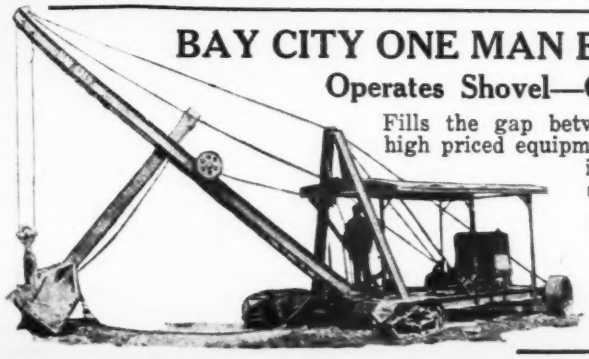
Write Today for Descriptive Catalog No. 50

UNIVERSAL VIBRATING SCREEN CO.
RACINE - - WISCONSIN

See P&Q HAND BOOK —Page 426

BAY CITY ONE MAN EXCAVATOR

Operates Shovel—Clam—Dragline



Fills the gap between hand labor and high priced equipment. Several hundred in operation, gasoline or electric power.

BAY CITY DREDGE WORKS
BAY CITY, MICH.
See P&Q HAND BOOK **Page 333**

WOODHOUSE DREDGE CHAIN

Makes Excavating Equipment Better

You know that no shovel or power excavator can work to its limit unless the chain used can efficiently hold up its end of the work.

To prove to you that **Woodhouse Hand-Made Chain** has met efficiently and economically all manner of requirements in chain service, to demonstrate to you that it will do the same for you, is all we ask.

Just fill in the coupon and let us send you proof of what **Woodhouse Hand-Made Chain** has done and is doing.

Specify Woodhouse Chain

WOODHOUSE CHAIN WORKS
Third St., Trenton, N. J.

WOODHOUSE CHAIN WORKS,
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Send me a copy of your testimonial pamphlet.

Name .....

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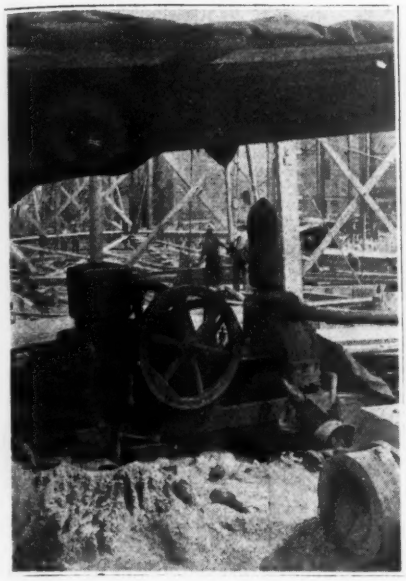
FOR DRAG LINES POWER SHOVELS DERRICKS

AMERICAN STEEL & WIRE COMPANY

Chicago **New York**



A REAL PUMP!

Whatever it may be that you have to remove in clayey, limey, or muddy water—the "DOMESTIC" Pump will carry it away. Contractors and quarry men find it an invaluable asset.

No odor or slop around the "DOMESTIC" Double Acting Trench Force Pumps. Will pump out pit or quarry bottoms, and discharge through long lines to disposal point. Maximum capacity—minimum weight.

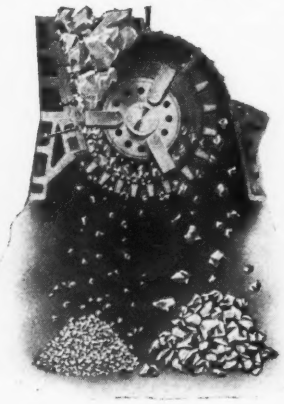
If you have too much water or not enough at your plant, there is a "DOMESTIC" Pump for your job which will prove useful and economical.

Write for Bulletin "TP" when you have a pumping problem to solve.

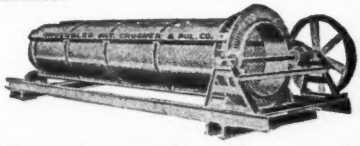
Domestic Engine & Pump Co.

Shippensburg, Penna.

Combining Advantages of expert service and proven equipment



Gruendler Service is designed to give plant owners the double advantage of expert service and tried and proven equipment. Whether your needs be a new plant or one piece of equipment your requirements will be met in an efficient and economical manner.



Gruendler Crushers, in more than one instance, have replaced a number of different types of crushers and are reducing 36-inch rock to 1½-inch in one operation.

Gruendler Screens and Elevators and other equipment are all made to the same high standard.

Consult our engineers with regard to your problems.

Our Local Representative
Will Gladly Call

Gruendler Patent Crusher & Pulverizer Co.
908 North Main St.
ST. LOUIS, MISSOURI

SALEM

ELEVATOR BUCKETS

You save money by using Genuine Salem Elevator Buckets. In 1880, Salem Buckets were awarded First Premium for superiority. Since then no other make has approached them in quality, long wear and unusual service.

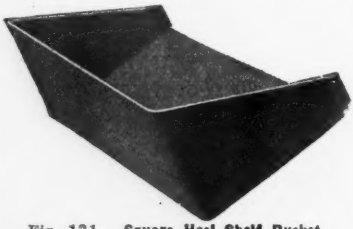


Fig. 131. **Square Heel Shelf Bucket** same as Fig. 132, with the exception of the heel.

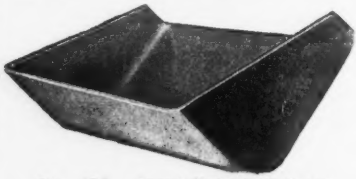


Fig. 132. **Round Heel Shelf Bucket** for handling damp materials which will not discharge readily from other styles of buckets.

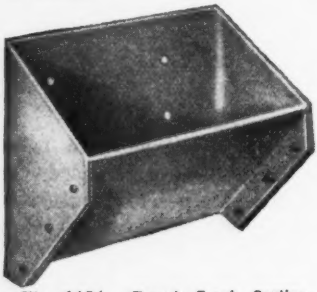


Fig. 1124. **Trough Front, Continuous Type" Bucket,** used for a variety of service conditions. Pours its load instead of throwing it.

Mullins Body Corporation

Successors to W. J. Clark Co.

106 Mill Street **Salem, Ohio**

Immediate deliveries made from our large stock of standard sizes and gauges, special types made to order promptly.

Write for Catalog No. 3625

Conveyor Strength and Adaptability

The Burch Portable Conveyor is of very strong and rigid construction. The frame is of 1½ x 2 in. angle iron, securely trussed and bolted. Strength, rigidity, durability are several outstanding Burch qualities.

The adaptability of the Burch Conveyor is another big quality. It is ideal for varied plant service, is portable, easily raised or lowered to any desired position. The belt is especially adapted to handle abrasive material and runs in trough style, thus carrying more and preserving the edge of the belt. It has a shield running the entire length between the upper and lower belts.

Furnished with gas or electric motor. Let us tell you of the savings effected with the Burch Conveyor.

THE BURCH PLOW WORKS CO.

CRESTLINE, OHIO

PORTABLE CONVEYORS

A Haiss Troughing Conveyor

Buy a Belt Conveyor that will stay on the job and keep working—a Belt Conveyor that carries the load on *ball-bearing* rollers that you don't have to oil—a Belt Conveyor built strong and sturdy, so it will last—a Belt Conveyor built up to Haiss standards, not down to a price.

Yet you can buy a *good* Haiss Conveyor for about the same price as the other kind.

Ask for Bulletin 1022

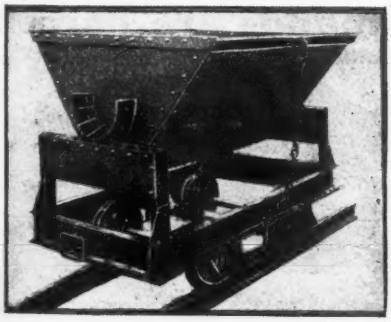
Manufacturer of THE GEORGE -Truck and- Wagon Loaders Portable Belt Conveyors

HAISS

Established 1892 MFG. CO. INC Clam Shell -Buckets- Mail Handling Equipment.

142nd St. and Rider Ave., New York, N. Y.

Representatives Throughout the World.
Cable Address "Coalhoist" New York—"Western Union 5 Letter Edition" Code

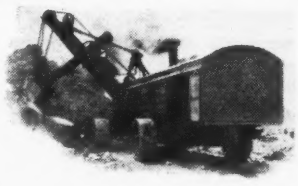


Best Dump Cars They Ever Used!

The Charles Warner Company have approximately 300 cars in operation, but Gehret Side Dump Cars, they claim, are the best they have ever used, and after trying many makes, they will use no other.

Gehret Cars are one-yard capacity side dump, and weigh about 450 lbs. more than other makes of the same capacity. Rockers are equipped with steel pins and bumpers, and boxes are very heavy. The brass bearings stand hard usage. Write today for circular.

GEHRET BROTHERS, Inc.
Bridgeport, Montgomery County, Pa.
Manufacturers of Structural Steel and Ornamental Iron Work.



OSGOOD

Continuous Treads and Traction Wheels For Railroad Shovels

Ask for Bulletin 247
It shows actual installations

Revolving and Railroad Shovels

OSGOOD

Marion Ohio

102,780 tons of shale being moved at quarry of Colorado Portland Cement Company by 17,890 pounds of explosive.

Cordeau was used to detonate the explosive charges in the thirty-nine well drill holes and assisted in accomplishing these fine results.

For Safety and Efficiency, use Cordeau-Bickford, and the results obtained will satisfy you that Cordeau-Bickford is an efficient detonating agent.

The Ensign-Bickford Company

Original Manufacturers of Safety Fuse

Established 1836

SIMSBURY, CONNECTICUT

When the service demands are hardest

It is during the rush periods, when the demands on your conveyor are excessive that the superiority of the frictionless, smooth operation and strength of Conweigh Idlers is most apparent.

The seven following features are important factors in Conweigh Idler efficiency:

A Hardened steel "Cone", fitted on turned steel shaft.

B Pressed steel "Ball Retainer".

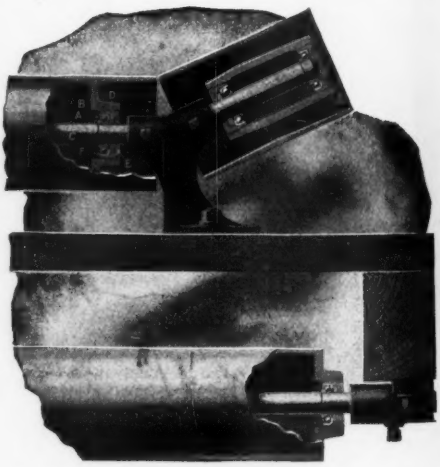
C Turned steel shaft, set screwed in Idler brackets.

D Oiled washer of felt or carded wool.

E Hardened steel "Plug", screwed into pulley hub.

F Brass plug for lubrication.

G Lock screw to prevent hardened plug from turning.



Write for detailed information.

THE CONVEYING WEIGHER COMPANY

90 West Street ENGINEER & CONTRACTOR New York

CYCLONE NUMBER FOURTEEN BIG BLAST HOLE DRILLS

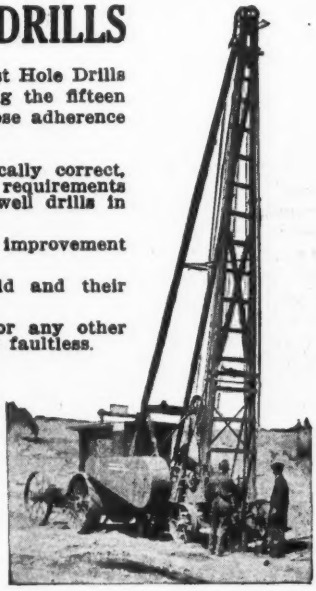
Whatever success Cyclone No. 14 Big Blast Hole Drills have attained in the quarry industry during the fifteen years of their existence has been due to close adherence to the following ideals and principles:

1—Starting with a design that was basically correct, originated after a close study of the requirements at the very beginning of the use of well drills in quarrying.

2—Always welcoming suggestions for improvement from quarry operators.

3—Keeping in close touch with the field and their ever-growing requirements.

4—Never holding the idea that a drill or any other piece of machinery could be perfect or faultless.

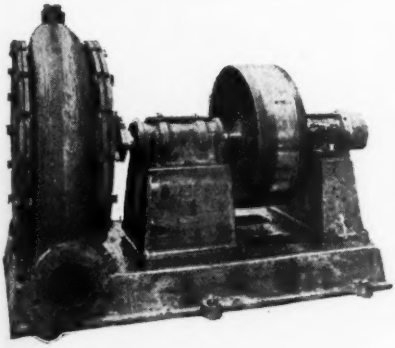


The story of the development of Cyclone No. 14 drills is completely told in our 100-page catalog B-45. It also contains 40 pages of cost and operating data on quarry drilling and blasting. Ask for a copy.

THE SANDERSON-CYCLONE DRILL CO.
Orrville, Ohio

Eastern & Export Office:
30 Church St., New York City

PM Manganese Steel Castings



Miscellaneous Manganese Steel Castings of All Descriptions at Reasonable Prices

Manganese Steel Sand and Gravel Pumps

A strong, sturdy, serviceable pump.

Built in all sizes.

Belt driven or direct connected motor driven.

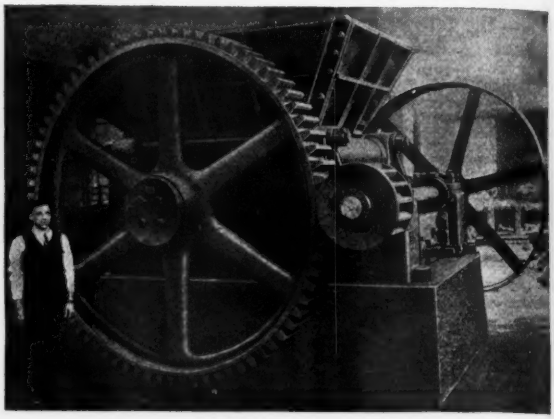
Send pump inquiries to:

W. H. K. BENNETT CO.
20 E. Jackson Blvd. Chicago, Ill.

PETTIBONE MULLIKEN CO.
CHICAGO, ILL.

A Product of Crusher Experience

Many years of practical experience in building and operating crushers is behind the McLanahan Single Roll Crusher. The small crusher—5 to 50 tons per hour—has proven the ideal crusher for rock phosphate. Over 50 of them are in use in Florida on hand rock. The large capacity machine was built to replace gyratory and jaw crushers on limestone for blast furnaces and railroad ballast. These are strong and well-built machines; the gearing is extra heavy; the roll shell a solid cylinder of chilled charcoal iron. Our claims for these machines are many.



Write for particulars on crushers, screens, washers, Elevators and other equipment.

McLANAHAN-STONE MACHINE CO.
HOLLIDAYSBURG, PA.

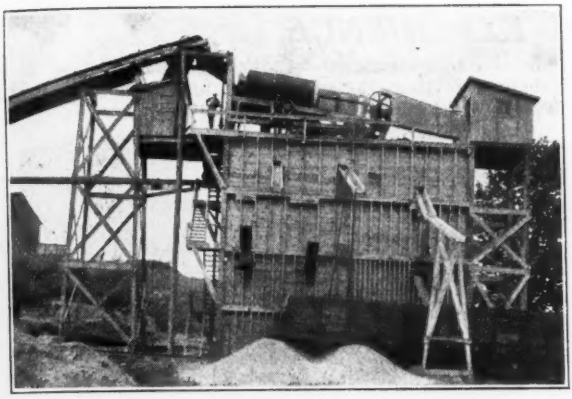
WOVEN WIRE SCREENS

Properly chosen screens save Power, Attendance, Investment and Replacement costs, improve your product and increase your output.

Catalogue No. 47-E is a Text-book on Screens. It's free. Get your copy from the first edition.

The LUDLOW-SAYLOR WIRE COMPANY St. Louis
610 South Newstead Avenue

FOR CLEAN SAND AND GRAVEL



USE RELIANCE SCREENING, WASHING AND CRUSHING EQUIPMENT

Stationary and portable units in capacities from 100 to 1,500 tons per day. We offer a full line of roadbuilding, quarry or sand and gravel handling equipment. Let us prove the superiority of Reliance units.

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UNIVERSAL ROAD MACHINERY CO.

Kingston, N. Y.

141 MILK ST., BOSTON—PEOPLES GAS BLDG., CHICAGO—114 LIBERTY ST., NEW YORK

Use Curtis Compressors

For all drilling and other quarry operations requiring pneumatic tools—use compressed air supplied by a Curtis Model "A". Fully enclosed Controlled Splash Oiling Compressor.

Curtis Model "A" Air Compressors are the result of over 28 years spent in the design and manufacture of air compressors known everywhere for their advanced engineering features, extreme durability and all-round mechanical excellence. They are full self-oiling through means of a controlled splash regulatable sight feed lubrication system. Heads, valves and cylinder walls are water cooled and present a greater cooling surface than in double-acting compressors of equal capacity. This feature increases volumetric efficiency. Fully enclosed—dust and dirt proof. Built in various sizes and capacities up to 250 lb. displacement.

Write for further details—ask for Bulletin C-3

CURTIS PNEUMATIC MACHINERY CO.

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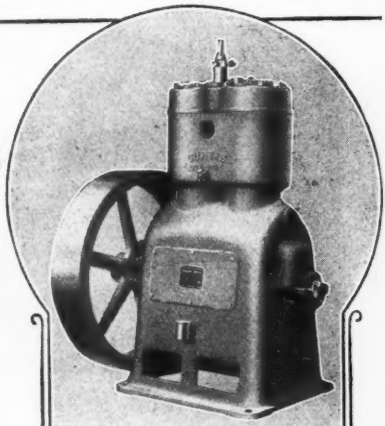
Branch Office

531-K Hudson Terminal, New York City



Model "A"

CURTIS

1854 71st ANNIVERSARY 1925

Curtis Pneumatic Machinery Co., 1628 Kienlen Ave., St. Louis, Mo.

Gentlemen: Please send full details on Curtis Air Compressors.

Name .....

Address .....

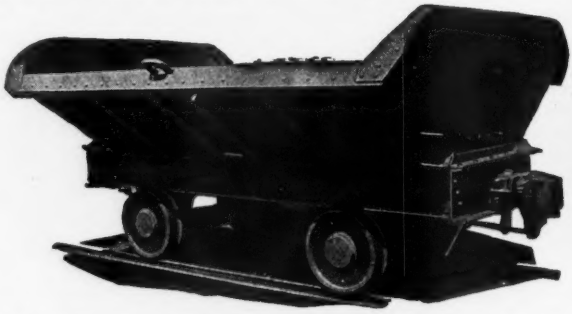
EASTON QUARRY CARS

EXPERIENCE

A prime requisite for the manufacturer of lasting quarry cars is experience. Years ago we began getting our experience and have been adding to it ever since by closely following each car in actual service.

TYPE
5794

Bulletin 21 shows other types of Quarry Cars.



EASTON CAR & CONSTRUCTION CO.

EASTON, PA.

New York Philadelphia Pittsburgh Chicago San Francisco

Where rugged equipment for year round service is needed you will save time and money by using our cars and locomotives.

Our quarry, Rocker Dump Type "Q" Cars are extra heavy all steel cars equipped with bronze bearings, over size axles and solid wheels having chilled treads. All castings are steel.

Likewise our MINSTER locomotives have steel frames

Write for catalogs and descriptive matter.

THE INDUSTRIAL EQUIPMENT CO., MINSTER, OHIO

BARS
SHAPES
WIRE

TRADE ROL-MAN MARK

PLATES
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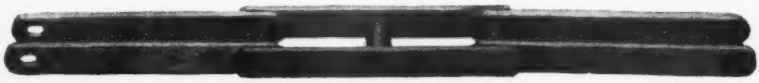
ROL-MAN FLAT LINK MANGANESE STEEL CHAINS

DREDGE, ELEVATOR, CONVEYOR DRAG, DRAW-BENCH, TRACTOR



Of all metals Manganese Steel has the greatest resistance to wear. Rol-Man Flat Link-Chains and accessories are made of the highest grade Manganese Steel, accurate to pitch and true in size.

The longer service that you get with Rol-Man Manganese Steel Chain, Pins, Bushings, Buckets, Bucket Lips, etc., makes them in the end, the more economical equipment.

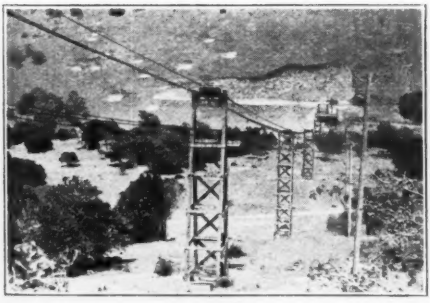
Diminished interruptions to operations ALONE more than pay the whole cost of "ROL-MAN" Manganese Steel Wearing Parts.

Send for catalogue describing Rol-Man Manganese Steel products.

MANGANESE STEEL FORGE CO.

Incorporated.

RICHMOND ST. & ERIE AVE., PHILADELPHIA, PENNA., U. S. A.



AGAIN

The **Basalt Rock Company,** Napa, California, decides to eliminate haulage worries through the use of another

AUTOMATIC AERIAL TRAMWAY

FIRST INSTALLATION:

3400 feet long from quarry to screening plant and bunkers. Present capacity, 90 tons of crushed rock hourly and designed for an ultimate capacity of 140 tons hourly.

LATEST INSTALLATION:

To reach more distant markets a 6200 foot tramway was installed from bunkers to railroad siding and barge terminal. The capacity of this line is the same as that of the first installation.

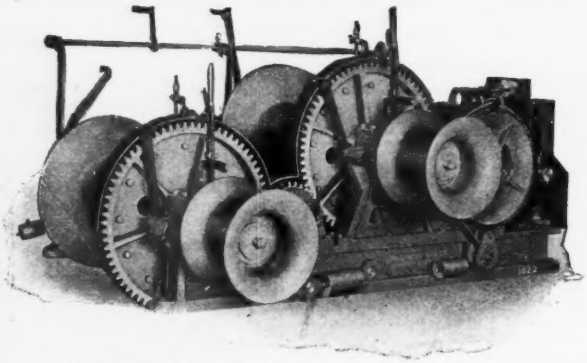
Write us about your problem. No obligation.

INTERSTATE EQUIPMENT CORPORATION

25 CHURCH STREET NEW YORK CITY

LIDGERWOOD HOISTS

Steam—Electric—Gasolene



Tell us what you wish in the hoist line.

We build types to meet every need in hoisting service.

Send for Catalogs.

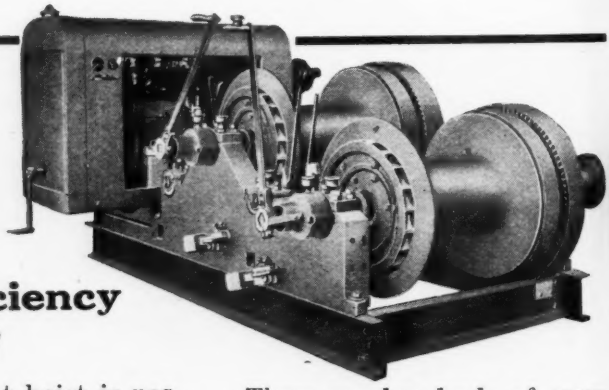
Our Engineers will consult with you at any time.

LIDGERWOOD MFG. CO., 96 Liberty St., New York

Chicago; Pittsburgh; Philadelphia; Detroit; Los Angeles; Seattle; Tacoma; Portland, Ore.; Brown-Marx Bldg., Birmingham, Ala. *Sales Agents:* Norman B. Livermore, San Francisco; Woodward, Wight & Co., Ltd., New Orleans, La.; Hubbard, Floyd Co., Boston, Mass.; John D. Westbrook, Inc., Norfolk, Va.; Canadian Allis-Chalmers, Ltd., Toronto. *Foreign Offices:* San Paulo, Brazil; Rio de Janeiro, Brazil; London, England.

Don't wish for Hoist Efficiency

Get it!



A really efficient hoist is possible. We claim that the O. K. Hoist is just such a hoist—a claim that we are prepared to substantiate by records and data on past and present performances of O. K. Hoists.

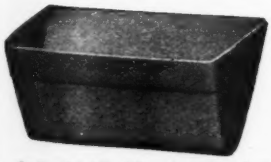
There are hundreds of operators using O. K. Hoists. What these hoists are doing for their owners is the best evidence we can offer of the ability of these machines. Write for this information.

O. K. CLUTCH & MACHINERY CO.

BOX 305, COLUMBIA, PA.

Howe Chains, Wheels and Buckets For Every Service

Sprocket Wheel for Drive Chain



Style "AA" Elevator Bucket

The design and manufacture of Howe Standard and Special Chains, Wheels and Buckets, are based squarely upon the particular service which these products must perform in actual use.

The performance records of Howe products testify to our unusual success in meeting the requirements of users in every industry.

Howe Chain Company facilities are thoroughly modern in every respect, approved methods of manufacture are employed throughout, and every process is under constant and careful supervision and inspection by experienced and capable engineers.

For Chains, Wheels and Buckets that give efficient and long-lived service, specify **HOWE**. Catalog, prices, and full particulars on request.

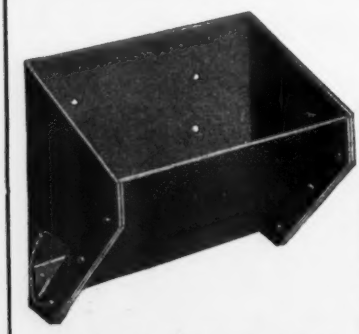
Howe Products

Howe Malleable Detachable Chains and Attachments. Closed End Pintle Chains, Malleable Iron and Steel Combination Chain, Heavy Closed End Pintle Chain, Ley Bushed Chain, Malleable Iron Roller Chain, Steel Bushed Roller Chain, Steel Strap Chain, Drop Forged Steel Chain, Malleable Iron Elevator Buckets, Sprockets and Traction Wheels.

HOWE CHAIN COMPANY, MUSKEGON, MICH.

CHAIN SPECIALISTS

HOWE CHAIN



Caldwell Buckets for Every Service

CALDWELL Buckets are built to give efficient performance under trying tests and widely varying conditions.

The Continuous Steel Bucket is especially adapted for handling cement, stone, crushed rock and other heavy material, and is made in various gauges of steel, to suit all requirements. They are accurately formed, and joints may be either riveted or spot welded.

No wedging of material, or sharp corners. May be arranged to overlap, thus forming a continuous bucket elevator. Load fully, with even, complete discharge.

When considering bucket equipment, for any or all needs, remember the name, CALDWELL. Remember, also, the names of Caldwell users, gladly furnished on request.

H. W. CALDWELL & SON CO.
LINK-BELT COMPANY, OWNER
Chicago, 1700 S. Western Ave.
New York, 2676 Woolworth Bldg.
Dallas, Texas, 810 Main St.

CALDWELL

5 Yard Green Power Scraper—12x14 Steam Hoist

digging from under water and delivering to belt conveyor. The owner would not sell, but there are plenty more where this came from. Also smaller sizes. For further particulars, write

L. P. GREEN **1248 Monadnock Block** **Chicago, Ill.**

Replacement time came, but not a sign of wear

The belts on this sand and gravel conveyor used to have an average life of eight months. Sometimes they had been taken up as many as eight times before they were replaced. When the owners installed a "U.S." Conveyor Belt they expected to be in the market again in another eight months. Instead, they reported at the end of that time that it showed not a sign of wear, and that it had never once been taken up.

This conveyor operates 12 hours daily, at a speed of 200 F. P. M. over 24" pulleys, and handles 1500 tons per day. The belt is a "U.S." Security Conveyor Belt 375 ft. long, 24" by 6 ply, ⅛" top cover, $\frac{1}{16}$" bottom cover, 28 oz. duck body.

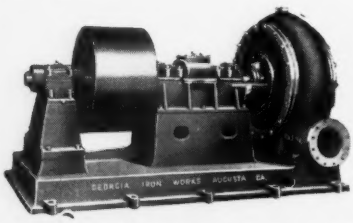
Trade Mark

United States Rubber Company

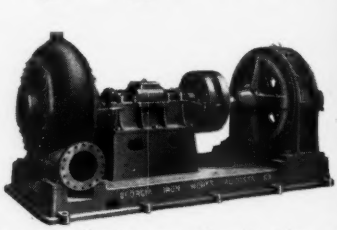
1790 Broadway New York City

Branches in every industrial center

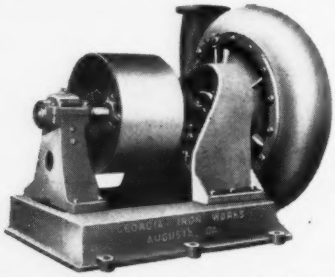
Hydraulic Equipment



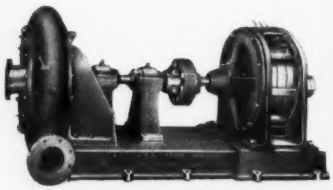
Heavy duty belt driven sand and dredging pump built in 8", 10", and 12" sizes.



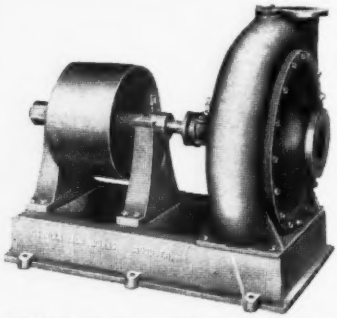
Heavy duty directly connected motor driven sand and dredging pump. Built in 8", 10", and 12" sizes.



Overhanging type belt driven sand and dredging pump. Built in 6" and 8" sizes.



Overhanging type sand and dredging pump on extended base directly connected to motor.



Standard belt driven sand and dredging pump. Built in 4", 6", and 8" sizes for belt drive only.

Flanged fittings generally used in pumping operations.. Built in 6", 8", 10", and 12" sizes.

The manufacture of hydraulic equipment for stripping and mining has been our specialty for a number of years, and our product has given high degree of satisfactory service in a variety of operations in different sections of the country.

Our line, as shown in cuts above, embraces a type and size pump for any sand and gravel operation. In addition to these pumps we build hydraulic guns, (giants), and a full line of flanged fittings.

Inquiries solicited and quotations submitted promptly.

GEORGIA IRON WORKS, Augusta, Ga.

Established 1891.